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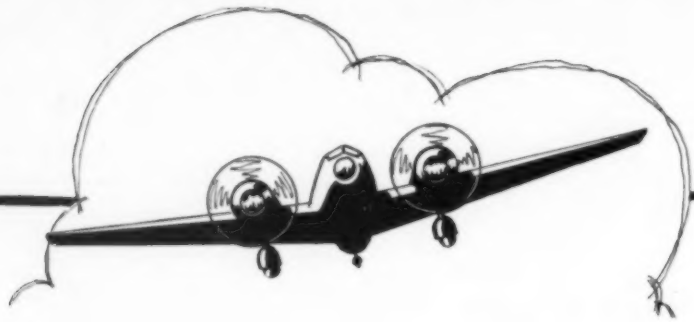

IN THE FRONT RANK

of the

CANADIAN AVIATION INDUSTRY

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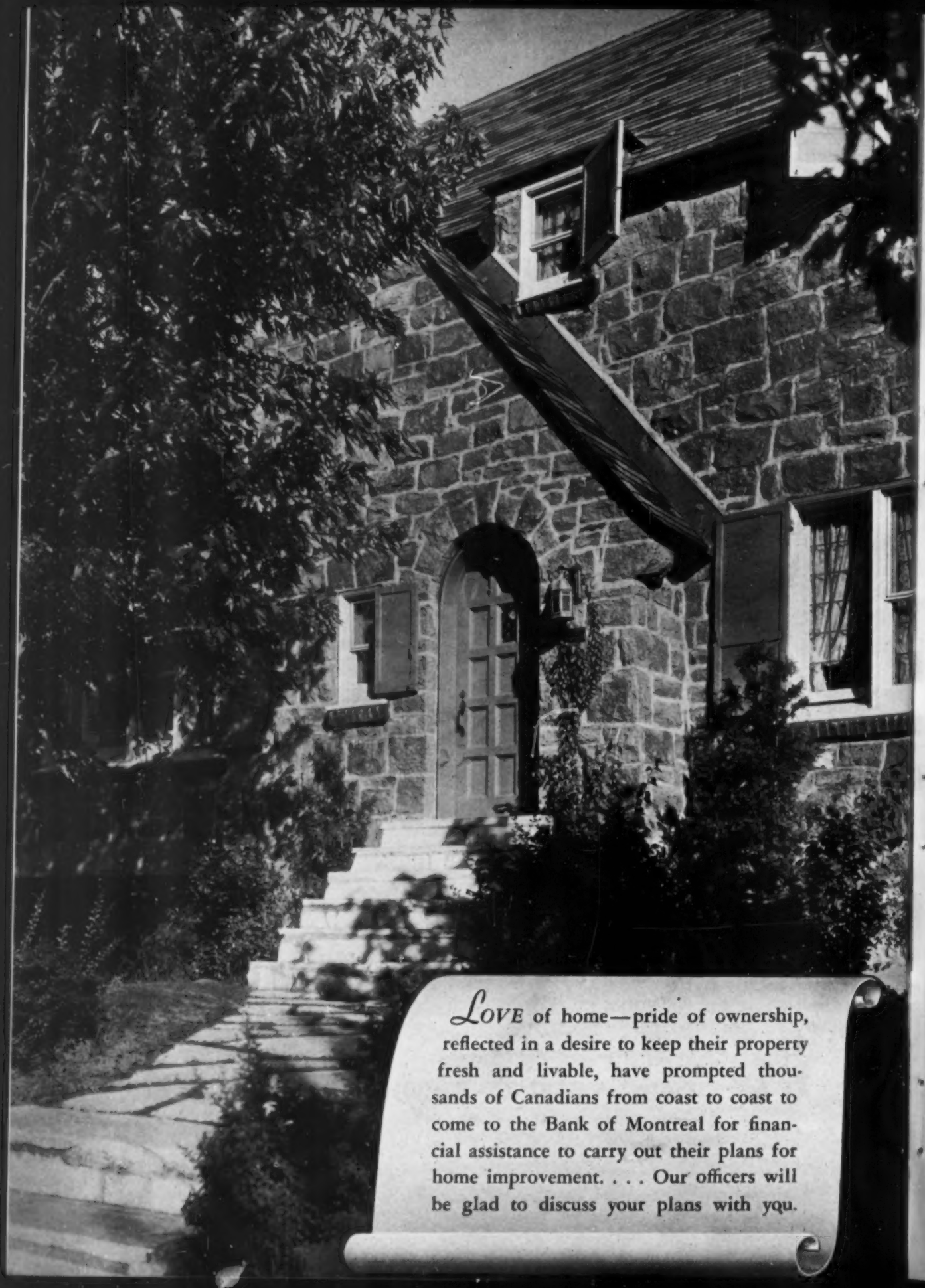

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CANADIAN GEOGRAPHICAL JOURNAL

Editor - *Gordon M. Dallyn*

172 WELLINGTON STREET, OTTAWA

This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustration of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth, and other parts of the world in which Canada has special interest.

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The British standard of spelling is adopted substantially as used by the Dominion Government and taught in most Canadian schools, the precise authority being the Oxford Dictionary as edited in 1929

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CANADA'S AIRCRAFT INDUSTRY

by J. FERGUS GRANT
Staff Correspondent

GEOGRAPHICAL considerations now present Canada and the British Empire with opportunities for economic advancement and their mutual protection through the development in this country of a progressive aircraft industry. Recognition is being given to the vulnerable position of Great Britain, and plans are being laid for the material expansion of manufacturing facilities across the Atlantic, where federal, provincial and commercial aviation requirements of the last fifteen years have created the foundation on which a great industry can be established. While efforts are being concentrated in the United Kingdom on the provision of aircraft in ever larger quantities to meet threats of aerial invasion from abroad, the public and its leaders are coming to appreciate the possible paralysis of its own source of supply by enemy action, and the urgent demand for an emergency replacement system. It is desirable that aircraft for this purpose and to supplement present production should be built far from the actual theatre of war. Canada is the logical Empire centre from which such supplies should be secured. The establishment of a transatlantic air service, with intermediate flying and service facilities for land or seaplanes in Newfoundland, eliminates many difficulties and even possible destruction by surface craft through providing rapid delivery of such supplies by air; summer and winter. With the prevailing wind in their favour and the latest meteorological information readily available by radio, large modern bombers, in particular, should have no need even of extra fuel tanks for the crossing. Furthermore, consideration should be given to the fact that Canada is the only Dominion accessible by air to Great Britain without involving passage over any foreign country.

Westland "Lysander" two-seat army co-operation plane, an order for twenty-eight of which has been placed with the National Steel Car Corporation, Limited, and will be built in the new factory just completed at Malton, Ont., and adjoining Toronto's terminal airport. Two machine guns are mounted in the streamline wheel casings above the landing lights, and another in the observer's cockpit. The Lysander has a maximum speed of 229 m.p.h. at 10,000 feet.

Relatively small orders for aircraft are hardly worth considering, so important are the issues involved, and the programme now being studied is based on manufacture over sufficiently long a term to justify establishment of the necessary facilities in Canada. Substantial orders placed here would, however, be small in comparison with the output in Great Britain, as indicated by the industry itself following the placement of orders in the United States for two hundred trainer and 200 "general reconnaissance" aircraft, for it maintained that British constructors were thereby enabled to concentrate on the specialized high-performance fighters and bombers that constitute military strength. Purchase was limited to two classes of aeroplane, declared by the British "exploratory" mission to be available for early delivery. That these supplemented home output merely to a modest extent was indicated by the subsequent placement of large-scale orders "of a character and size never before given to the British aircraft industry", as stated by Sir Kingsley Wood, Secretary of State for Air. Employment in the industry has increased from 30,000 in 1935 to more than 90,000 at the present time, exclusive of labour engaged by sub-contractors and suppliers of material.

The domestic demand for aircraft does not justify any material expansion in the Canadian aircraft industry for some years, but the necessary facilities can and will be provided now that substantial orders for aircraft are to be placed here by Great Britain and other countries, including France, which is in a similar vulnerable position through possible destruction by enemy action of aircraft factories. There is evidence of close co-operation between these two countries, and efforts may be made to secure equipment from this country to supplement production in France, thereby providing an increase in the demand that will further justify expansion in Canada. Steps will be taken to eliminate uneconomical expansion and, if and when the emergency passes, some provision for the conversion of manufacturing facilities to a more pacific use must be considered, together with the absorption of the technical and unskilled labour engaged, constituting a special system of amortization.

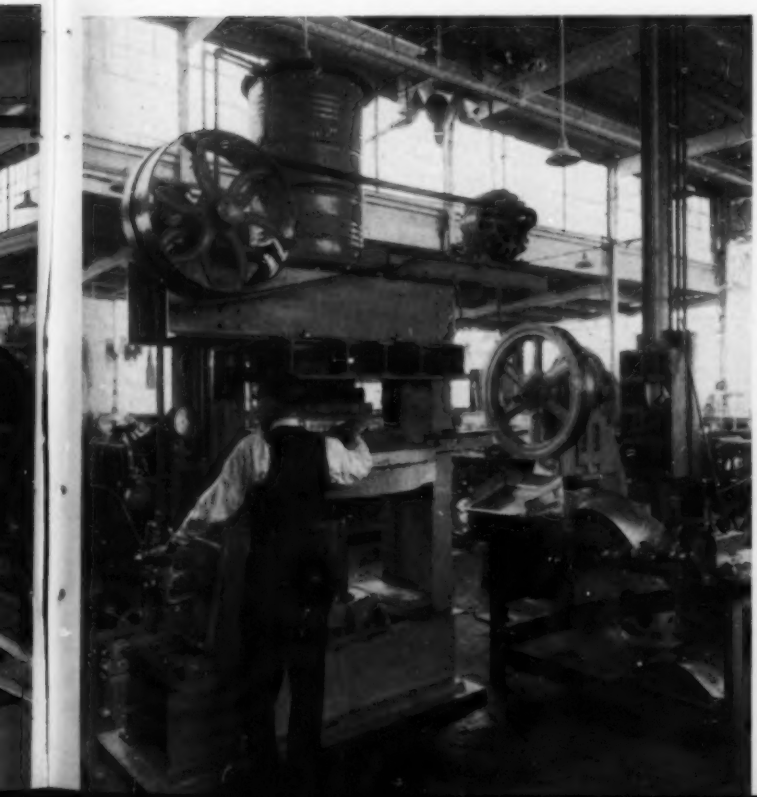
Although aircraft have been designed in Canada to meet special climatic conditions and requirements of commercial operators, expansion at present depends on the manufacture of proved types being produced in Great Britain or other countries, as considerable time and extensive facilities for research and experimentation are involved, and a substantial domestic demand necessary to justify such expenditure. It is desirable, however, that provision be made for an adequate supply of materials, such as aluminum plates, sheets, strips and extruded sections, the bulk of requirements in the aircraft industry having been secured to date from Great Britain and the United States. Between ten and fifteen times as much metal is being produced by the Aluminum Company of Canada as can be marketed in this Dominion in a form required by the aircraft industry, bauxite from British Guiana being refined in the province of Quebec by reason of the cheap power available. With a reasonable assurance that orders for such material will be forthcoming, provision for expenditure of several million dollars in the establishment of a suitable plant will be made. The facilities under consideration are not confined only to the provision of components for airframes, but for engines, airscrews and other accessories.

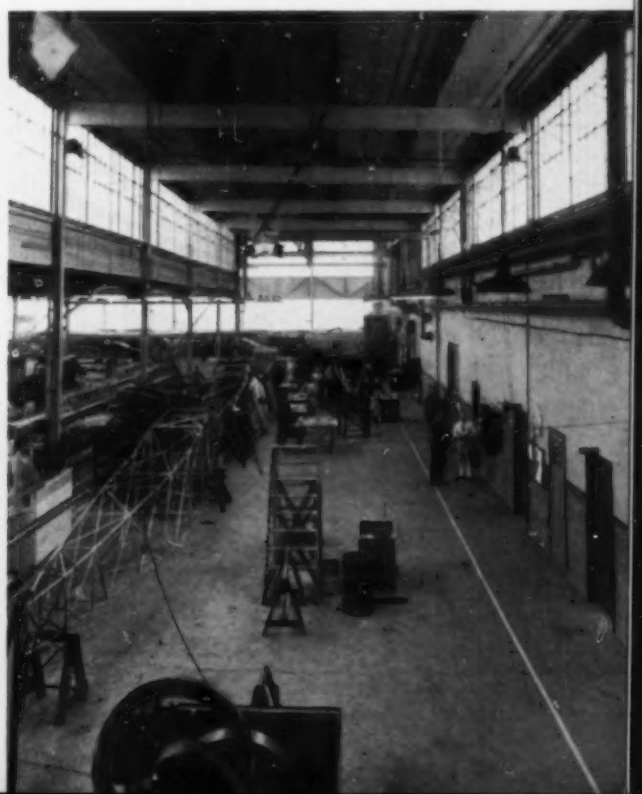
Factory at Longueuil, Que., of the Fairchild Aircraft, Limited, portraying wood-working equipment, hydraulic press with duralumin sections produced, and facilities available for the fabrication of metal fuselages. Aircraft nearing completion may be distinguished in the background of the left and right photographs.

Aluminum Sheets Imported.

During the last ten years, imports into Canada of aluminum plates, sheets and strips totalled $3,583,902 in value, to which the United Kingdom contributed $3,077,643 and the United States only $452,960. Total imports for the twelve months ending March, 1938, were $679,760, of which $543,561 is credited to Great Britain and only $110,466 to the United States. Switzerland supplied material to the value of $25,320. In the same twelve-month period, total exports of aluminum in bars, blocks, ingots, sheets, etc., had a value of $20,748,973. Of this, the United Kingdom took $11,050,523, the United States $2,874,731 and Japan $4,764,013. To prevent any misunderstanding, it should be mentioned that the import figures shown here do not pertain solely to the aircraft industry, but they indicate the importance of establishing facilities for the provision of necessary materials, especially as manufacturing requirements in the United States make Canada largely dependent at this time on Great Britain, where there is already a heavy demand from the aircraft and other industries. Now that the decision has been taken by Britain to support with substantial orders the establishment of a second source of aircraft supply in Canada, both as an emergency measure and to supplement home production, it is evident that the materials should be manufactured here.

With the same reasonable assurance of substantial orders, expenditure may be made for the manufacture in Canada of British-type engines, suitable for installation in the aircraft built for delivery to Great Britain or other countries, and also for the manufacture of airscrews. The possible destruction by enemy action of plants engaged in the production of engines and airscrews renders desirable the establishment of similar facilities in Canada to an extent comparable with those for airframes. While engines are being assembled here at present, imports of complete units and parts for this purpose during the last ten years having amounted to 1,264 and a value of $4,490,682, the establishment of a manufacturing plant in this country is largely dependent on an adequate domestic supply of aluminum drop forgings and complex castings, light steel forgings and other alloys to the same extent as that section of the industry producing airframes and other components. Assurances have been received that complete manufacturing facilities will be provided here for American-type engines of the most outstanding character, should a substantial demand be forthcoming. Research and other facilities available in the United States will be made readily





available by the parent plants. Adjustable, controllable-pitch and constant speed airscrews come within this same category.

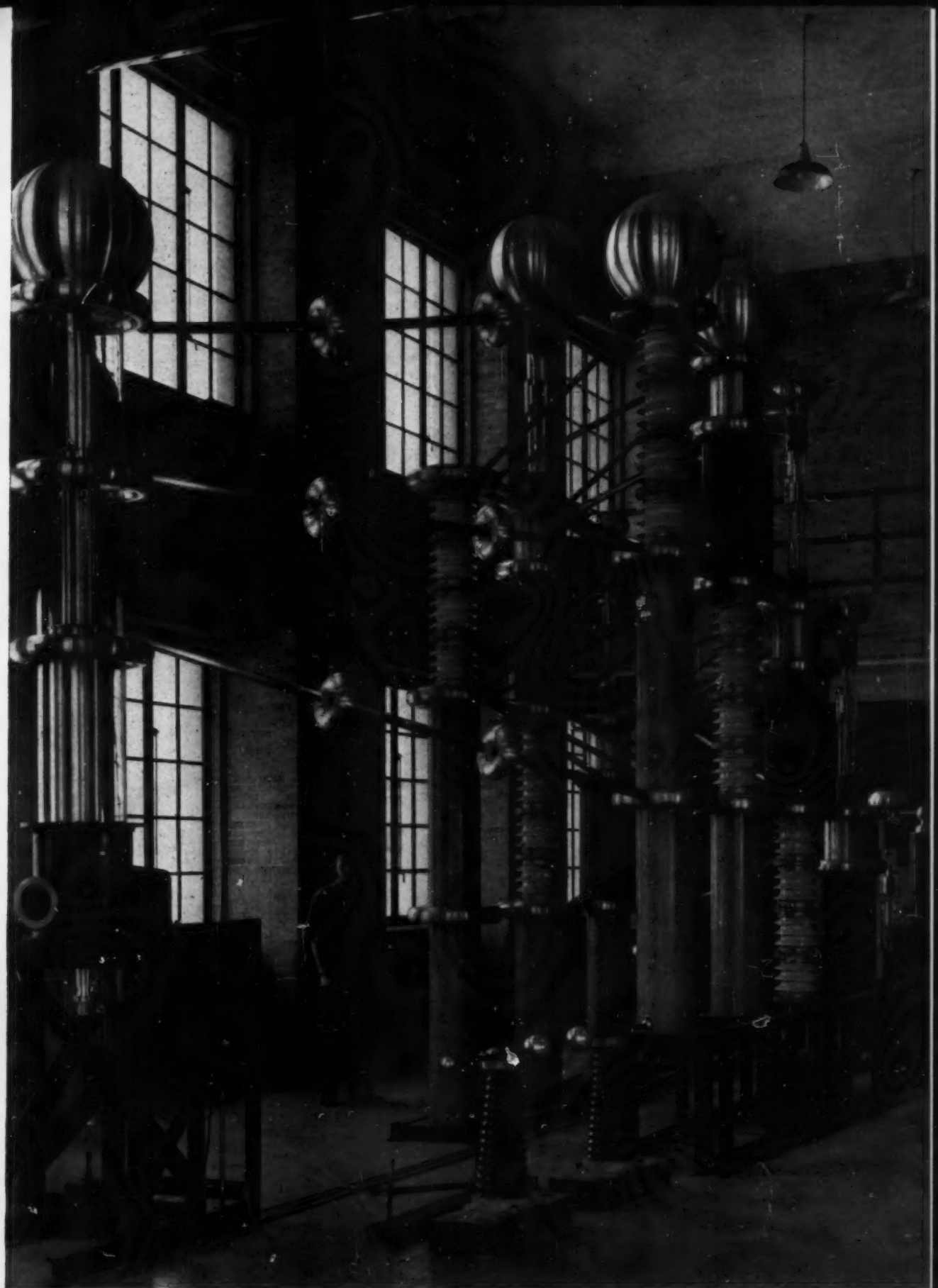
The merits of magnesium, which is little more than half the weight of aluminum, the respective specific gravities of which being 1.74 and 2.70, are appreciated, and alloys have been used in the production of airframes and engines. It is maintained that the properties of magnesium do not render this metal entirely suitable for airscrews. It has a wide application, in the cast and extruded form to unstressed components, such as engine crank cases and cowlings, fairings, seats, etc., thereby providing for a substantial reduction in weight without any sacrifice of strength. Aluminum is the most abundant of the non-ferrous metals in the earth's crust, comprising an estimated 7.9 per cent, as compared with 4.4 per cent for iron, 2.28 per cent for magnesium, 0.023 per cent for nickel and 0.0075 per cent for copper, so there is little possibility of any shortage being experienced for many years. Other efforts are being made to lighten aircraft without sacrificing strength by the use of compressed and impregnated woods, plastics, etc., in all of which research Canada is materially interested. Wood, in fact, is the principal material used in the construction of a twin-engined monoplane for which the largest order for trainers ever placed by the British Air Ministry was recently announced. The wings have wooden spars and a stressed-skin plywood covering, which carries a share of the stresses imposed on the machine. The fuselage, built in two sections, has a semi-monocoque wooden rear section, while that to the fore is built of wood, welded steel tube and light alloy. It is proposed to build all training aircraft of wood, especially as new adhesives developed in recent years are greatly superior to glue, rendering plywoods almost indestructible under all normal stresses. Furthermore, employment is provided for wood-workers, and even girls may be engaged for light construction duties.

National Research Council.

Material assistance to the aircraft industry is being provided by the National Research Council and its laboratories in Ottawa. Facilities include a wind tunnel, where the characteristics of wings and other components are investigated, and a dynamometer on which engines up to 1,400 horsepower receive type tests. Research on floats is carried on in a large testing tank, and a well-equipped fuel laboratory enables a competent staff to investigate potentialities of this country's petroleum resources, with particular relation to the propulsion of aircraft. Problems pertaining to light alloys and stainless steels are considered, and aid extended in this respect to a young but well-established industry on which aircraft manufacturers are coming to depend to a material extent. The "precision" of gauges can be tested to 1/200,000th part of an inch, thereby providing for the accuracy so important in the construction of aircraft. This is of particular importance to that industry engaged in the manufacture of tools.

One of the problems solved by the Associate Committee on Aeronautical Research pertains to castings, thousands of which are required in building aeroplanes, and the production of which is considered more of an art than a science. When it was appreciated that much faulty material was being manufactured, and the safety of aircraft, their pilots and passengers jeopardized, X-ray treatment was made mandatory by order of the Department of Transport. The industry was badly shaken, when 98 per cent of the castings submitted for examination were rejected, but the situation was rectified. In a recent month, rejections dropped to less than seven per cent, and perfection is anticipated. Between

Model testing basin in the laboratories at Ottawa of the National Research Council, where much valuable data pertaining to aircraft floats has been secured. Unserviceable pontoons, supplied by the Department of National Defence, have also been tested under static loading for the two-wave landing condition, and even to failure under shearing and bending loads approximating those encountered in service.

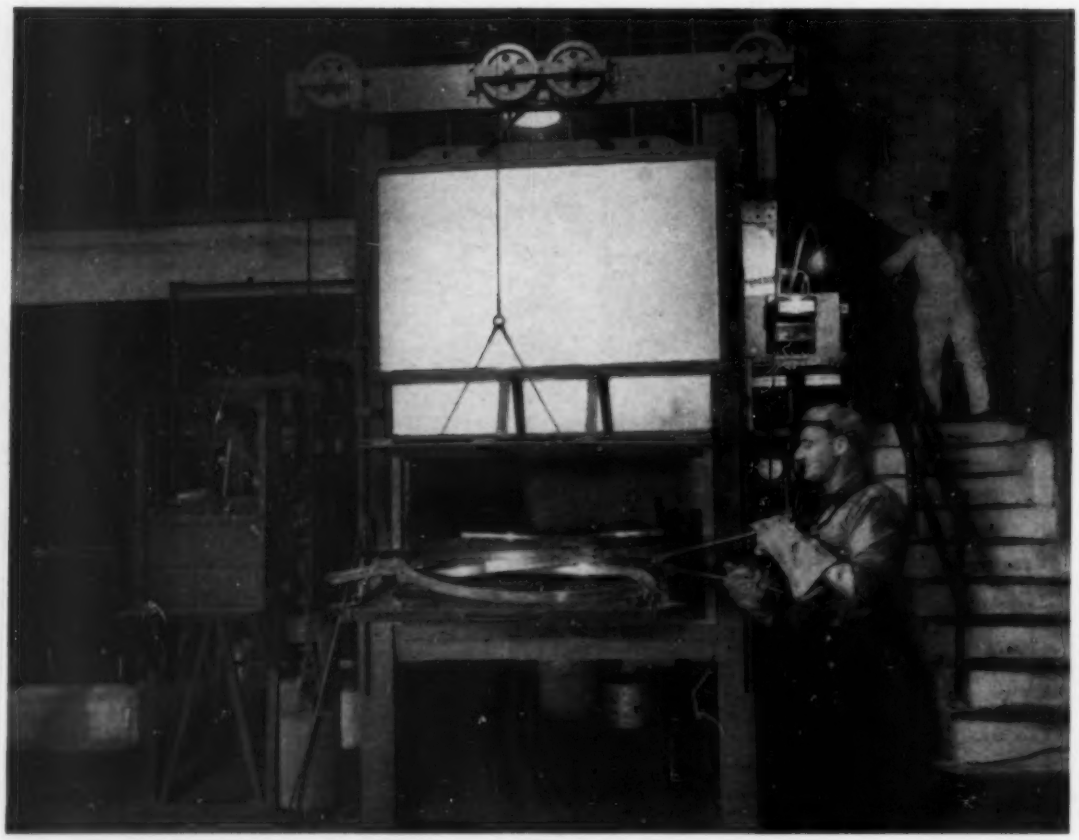


The 600,000-volt X-ray installation, designed and recently completed at relatively little cost in the laboratories of the National Research Council at Ottawa. This is part of the equipment available for the inspection of metal castings and welds used in the construction of aircraft. The X-ray tube is in the left foreground, with the generating equipment to the right.

300 and 400 castings were being handled per month, test fees paid by the manufacturers, with contributions by the principal purchasers, defraying all costs. The time has now come for the industry to install its own X-ray equipment, when only sample lots will be inspected at Ottawa. Technical assistance and inspection facilities will be furnished to individual firms, thereby eliminating any possible lack of confidence in the production here of perfect castings, should this prove an important factor in the placement by Great Britain and other countries of large orders for aircraft in Canada. As in the case of airframes, engines, airscrews and other supplies involving research and experimentation, whether for military or commercial use, the vulnerable position of British laboratories renders desirable the establishment and the maintenance of such facilities in this country. Although fears may be expressed that the United Kingdom is thereby being subjected to loss of prestige, it is appreciated that adequate preparation for the preservation of peace must be made now, and that satisfactory results can only be secured through full co-operation.

Aircraft Association Assists.

Over-expansion in the aircraft industry can be eliminated, and provision made for close co-ordination in this country through the Commercial Air Transport and Manufacturers' Association of Canada, of which Mr. R. J. Moffett is president. Established in November, 1934, its membership now comprises sixteen operating, fifteen manufacturing and eight associate members, the latter including firms engaged in providing equipment or services to the industry. It aims "to establish and maintain for the use of its members a bureau of information pertaining to aviation generally, and to maintain a registration of aircraft personnel; to collect and to study all legislation pertaining to aviation in Canada or elsewhere; to procure and maintain uniformity in the customs and



Heat-treating facilities in factory at Longueuil, Que., of Fairchild Aircraft, Limited

Aircraft factory, airport and seaplane harbour of the Fairchild Aircraft, Limited, located at Longueuil, Que., on the south shore of the St. Lawrence River, across from Montreal. Here are being built eighteen Bristol "Blenheim" twin-engined day bombers for the R.C.A.F.

Photos by Canadian Airways, Ltd.

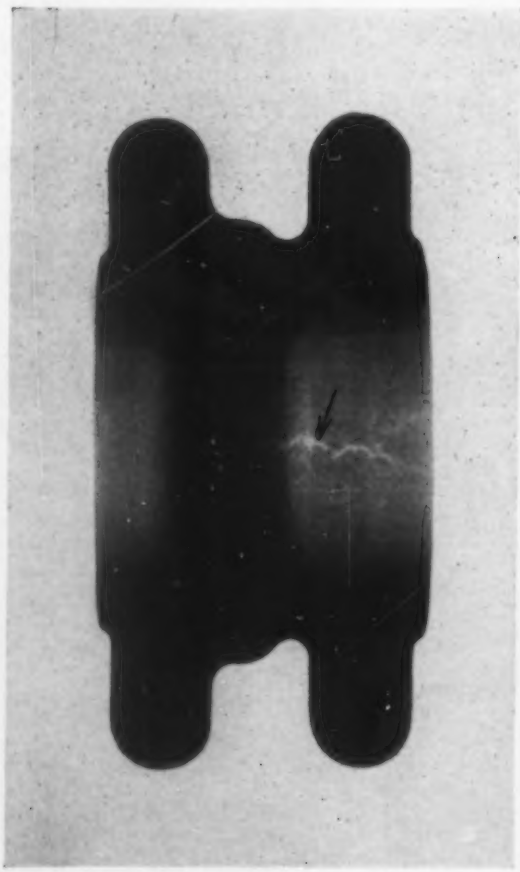
Aircraft factory, shipbuilding plant and floating drydock of Canadian Vickers, Limited, Montreal, where the post war aircraft industry of Canada had its inception in 1923. Here are being built ten Supermarine "Stranraer" twin-engined long distance reconnaissance flying boats for the R.C.A.F.

usages of operations, trade and commerce amongst all taking part in commercial aviation; and to collect, publish and disseminate information relating to aeronautics and to carry out programmes of publicity and advertising intended to encourage and advance legitimate interests of commercial air operators and manufacturers of aircraft, aircraft engines and accessories."

Recognition of this association and its contribution to the aircraft industry has been shown on several occasions by the Air Ministry, which also co-operates closely with the Society of British Aircraft Constructors, Limited, an organization of great influence by reason of the strong internal support forthcoming from its members. The mutual interests of their respective companies and the country as a whole are thus advanced.

Although the financial aspect of aircraft manufacture in Canada looms large with the prospective placement of substantial orders, the human element is being recognized as a responsibility of paramount importance in relation to the provision of labour. There has been little opportunity for advancement in the industry up to the present, orders now on hand being confined to approximately one hundred aircraft for the R.C.A.F., but the future offers employment for a large number of individuals with some technical experience. It should be remembered that an estimated total of 90,000 persons is engaged in the British aircraft industry at this time, suggesting the adoption by Canada of a conservative figure in estimating the volume of employment to be provided by the placement here of substantial orders. The so-called secondary plants, engaged in the manufacture of materials, may anticipate a similar increase in the pay roll.

While no difficulty is contemplated in obtaining an adequate supply of unskilled labour, or in training this class to perform various mechanical duties, restrictions involving the employment of one skilled for every unskilled worker, for example, present a serious problem. The removal of such obstacles can be effected, however, through close co-operation of all parties and a fuller appreciation of the factors involved. By reason of its highly specialized nature, involving precision work by many men in place of the well-known mass production methods, it is desirable that applicants for positions or jobs should have some form of technical or manual training. As little actual design is being attempted, university graduates with or without aeronautical knowledge are at present in little demand, though they will contribute materially to the new expansion programme. The ideal type is a man with a high school certificate who has subsequently passed through a technical school equipped to provide good training in the use of precision and other machinery. Sheet metal workers, men employed in machine shops throughout the country, in the equipment of sleeping and other railway passenger cars, where fine work is required, and in the manufacture of automobile engines can be absorbed by the aircraft industry. Some experience in reading blue prints is of value, as between seven and ten thousand



X-ray photograph of an aluminum alloy casting for a clamp used in aircraft structure, taken in laboratories of the National Research Council at Ottawa. The shrinkage crack, revealed by an irregular white line, seriously impaired the strength of this part, and was not evident by visual inspection.

drawings are required in the production of a modern aircraft. The provision of "jigs", fixtures," "dies" and special tools facilitates fabrication and the introduction of mass production methods, thereby reducing costs. With the use of such equipment, accuracy in "mating" parts is easily maintained and interchangeability assured.

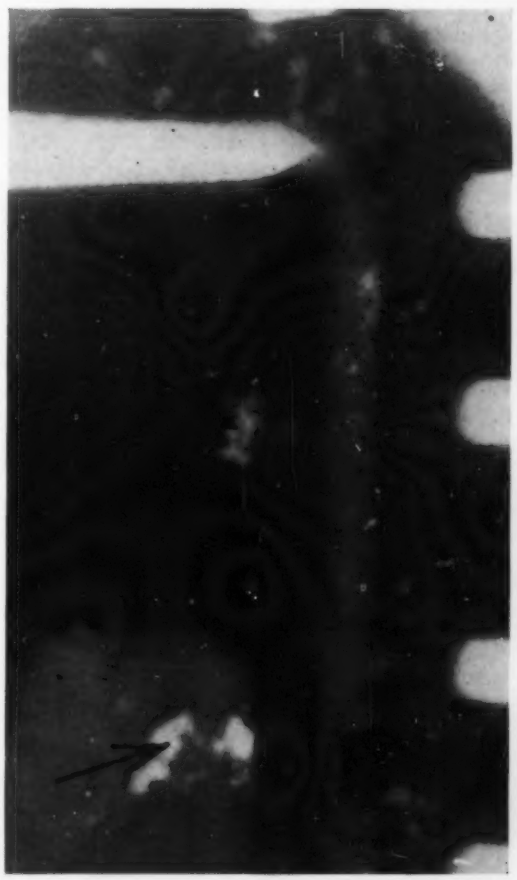
Development of an apprentice system, to which technical schools are complementary, is considered desirable, and possibly the establishment of schools in conjunction with aircraft factories. An appreciable number of young men, between sixteen and eighteen, can be absorbed, receiving $490 per annum at the rate of 20 cents an hour the first year. This rate is increased to 25 cents an hour the second year and to 35 cents the third year. A minimum of 40 cents an hour thereafter, estimated on the basis of a 47-hour week, provides an income of $977.60 per annum. Scholarships awarded by the Society of British Aircraft Constructors, the purpose of which is to enable talented boys from poor families to train for high positions in the British industry, provide a sum sufficient, with wages paid them as apprentices, to guarantee an income of £ 2 per week, which is approximately the same amount as an apprentice obtains here during his first year, namely $9.40.

Curtailment of flying operations in connection with mining activities in Northern Canada has necessitated the dismissal of mechanics, apprentices and other individuals classed as helpers by some companies. These men would be available, in some measure, should there be any material expansion in the aircraft industry. Many enquiries are received from semi-skilled and unskilled workers, and a multitude from boys between 18 and 22 who are even prepared, if this was permitted, to serve without pay in order to secure a start in the industry. Whereas younger men are found more adaptable and easier to train than older men, it is appreciated that a place should be found for the latter, whose experience in other fields might be turned to good account.

Importation of trained inspectors from Great Britain and the United States will be necessary with establishment of an expansion programme, and some highly skilled craftsmen may be required to supplement the supply in this country. Whereas neutrality laws and other restrictions can enforce an embargo on the exportation of materials from the United States, nothing can prevent the exportation of brains, should a need for additional technicians develop. If necessary, provision could be made for men arriving from abroad to take out naturalization papers. No such steps will be taken, however, until Canada has been combed for Canadians qualified to fill positions created. Everyone engaged in filling a government contract must be a British subject.

Large Order Expected.

Following the decision of the British Air Ministry to avoid multiplicity of types of aircraft, and the probable adoption of this principle in Canada, consideration is being given to the establishment of a



X-ray photograph of an aluminum alloy casting for part of an aircraft undercarriage. Internal gas holes, indicated by the irregular white spots, impaired the strength of the section. Foundry technique was modified and faultless castings were thereafter produced.

central assembly plant, and the manufacture of components for one or two proven aircraft capable of being flown across the Atlantic. A preliminary order for long-range bombers will involve an expenditure of nearly $100,000,000, which may be compared with that of $40,000,000 by the Imperial Munitions Board in 1917 and 1918 for the manufacture of nearly 3,000 Canadian "J.N.4" (Curtiss "Jenny") aeroplanes and the provision of training facilities for the Royal Air Force in this country, the total value of the planes alone being set at $14,000,000. Orders for training aircraft in large quantities are also anticipated.

That little difficulty will be experienced in designing a new type of aircraft capable of completing the transatlantic crossing without any difficulty, even if existing types do not meet British Air Ministry requirements from Canada, is indicated by the recent establishment of a record non-stop formation flight of 4,300 miles. Four Vickers Wellesley "geodetic" bombers flew together from England to the Persian Gulf and back to Egypt, and a non-stop flight of 8,000 miles from England to Australia is now contemplated. The distance from Montreal to London is 3,250 miles, whereas that between Botwood, Newfoundland, and Foynes, the Irish terminal from which the "Mercury" recently took off for Montreal, is only 2,010 miles.

The possible exploitation of the purchaser of aircraft in such large volume has been considered as one of the foremost aspects of the situation, and efforts will be made to protect the taxpayer in Great Britain or any other country that may consider the placement of substantial orders for such equipment in Canada. Measures under consideration involve formation of a corporation that should issue no stock or pay dividends, being maintained by the industry as a whole. Its main purpose will be to negotiate with prospective purchasers of aircraft, and thereafter to distribute orders for the construction of complete machines or components. Whereas material support has been extended to the industry during the last few years by the placement of orders for the Royal Canadian Air Force, and transactions between the British "exploratory" mission and the manufacturers were fostered by the Department of National Defence, to which they submitted individual reports on facilities available, it is deemed desirable that contracts be awarded by agreement with the industry itself. Present plans will, it is hoped, eliminate the spectre of speculation based on unfounded reports of awards to various companies, and prevent the destruction of public confidence in the project. The co-operation of financial interests is also being sought in this respect.

First Canadian Flight in 1909.

Thirty years have elapsed since the aircraft industry in Canada had its inception with the design and fabrication of a machine flown for half-a-mile on February 23, 1909, above the ice-covered surface of the Bras d'Or Lakes, in Nova Scotia. The pilot was J. A. D. McCurdy, now resident in Montreal, one of a group of enthusiasts headed by the late Dr. Alexander Graham Bell, the Scottish immigrant inventor of the telephone and phonograph. Little did Bell realize at the time that the passage of relatively few years would see huge flying boats skirting the same shores of Cape Breton Island, bound for Europe, with those aboard in constant telephonic communication with stations on either side of the Atlantic. He lived to see the initial transatlantic flight completed ten years later by Sir John Alcock and Sir Arthur Whitten Brown, but died at Baddeck on August 2, 1922, the year in which a decision was taken to establish the foundation on which the Canadian aircraft industry, as at present constituted, has been slowly but steadily erected.

Large-scale production of aircraft in Canada was undertaken by the Imperial Munitions Board during the Great War, when there was an urgent demand for aircraft by the Allies. Canadian Aeroplanes, Limited, was organized in December, 1916, and in the twenty-one months of its existence it built 2,900 aircraft, valued at $14,000,000, at Leaside, near Toronto. Many of these were used for training Royal Air Force personnel, and others were shipped overseas for active service. The plant ceased operations after the Armistice, and civil aviation in Canada depended for the next four years largely on surplus war material. Of the 4,000 pilots trained or partially trained at the Armistice, and the 3,500 cadets receiving ground training courses, some continued to fly. Although commercial flying operations made progress, the volume of business did not immediately justify the depreciation

of whole fleets of obsolete aircraft and the purchase of modern equipment. During this period, however, experience enabled a design suitable for Canadian conditions to be determined.

Construction Began In 1923.

Stimulus was provided by the decision to acquire new machines for the Royal Canadian Air Force, and the industry was re-established in 1923, when Canadian Vickers, Limited, of Montreal, secured a contract to build eight single-engined flying boats. Owing to the urgent demand for delivery, and time required to equip the shops, two of these were purchased in England. Orders were also received from commercial aviation companies in Canada, including the fabrication of floats for seaplanes, main spars, struts, skiis and fittings, the overhaul and erection of several aircraft and the storage of others during the winter season. Despite relatively small requirements, considerable interest in the Canadian market was shown by British manufacturers, and several leading aircraft constructors visited the Dominion during the year. Their investigations indicated that machines built for European conditions would not necessarily prove suitable in this country, and it was felt that certain technical details, such as the seasoning of timber used in the manufacture of aircraft, rendered preferable their construction in Canada.

"The manufacture of aircraft engines is expensive and can only be conducted efficiently on a production basis", reads a report made in 1923 on this phase of the industry. "It is probable, therefore, that the demand for aircraft engines in Canada will not justify the establishment of a special industry for this purpose for many years. The demand for engines must, therefore, be supplied by import until the requirements for any one type of engine justify the creation of a special industry for the purpose. The same considerations must apply to the supply of instruments and many accessories used in aviation." With these factors in mind, plants equipped only for the assembly, overhaul and repair of British and American-type engines were established in Canada, though expansion to provide for their manufacture is now considered, depending on a reasonable assurance of sufficient orders for military fighters, bombers and trainers to justify the capital expenditure. Since 1927, when assembly plants were established in this country, engines and complete parts imported for use only in the equipment of aircraft totalled 1,413, having a value of $5,306,044. The large number of 362, valued at $1,667,850, imported in the twelve months ending last March is attributed to the arrival of an unusually large number of British engines complete to be installed in aircraft of British design ordered by the Royal Canadian Air Force and being built in Canada. The respective figures for the last fiscal year were 144 engines, valued at $665,428, imported from the United Kingdom, and 218 engines, valued at $1,002,422, imported from the United States.

Aircraft production between 1923 and the end of 1937, including the assembly of airframes, totalled 981 machines valued at $12,867,886. It is interesting to note that imports of aeroplanes and parts between 1923 and the year ending last March amounted to 978 machines, and a value of $11,291,260. The resemblance of these figures is natural, as the bulk of materials and parts for manufacture in this country had to be imported and clearly indicates the advisability of establishing sources of material supply if the industry is to secure a measure of relative independence. Of the aeroplane import total of 978, there were 661 machines and parts, having a value of $6,396,153, brought in during the four years following provision in 1927 for establishing light aeroplane clubs throughout the Dominion to stimulate the supply of trained pilots.

Eleven companies are at present actively identified with the manufacture of aircraft in Canada, all of these being members of the Commercial Air Transport and Manufacturers' Association of Canada. With the location of their respective plants, they are listed as follows: Boeing Aircraft of Canada, Limited, Vancouver, B.C.; Canadian Car & Foundry Company, Limited, Fort William, Ont.; Canadian Vickers, Limited, Montreal; Cub Aircraft Corporation, Limited, Hamilton, Ont.; de Havilland Aircraft of Canada, Limited, Downsview, Ont.; Fairchild Aircraft, Limited, Longueuil, Que.; Fleet Aircraft, Limited, Fort Erie, Ont.; MacDonald Bros. Aircraft, Limited, Winnipeg, Man.; National Steel Car Corporation, Limited, which has recently established aircraft manufacturing facilities adjoining the new Toronto terminal airport at Malton, Ont.; Noorduyn

Grumman two-seat fighters being assembled in the Fort William plant of the Canadian Car & Foundry Company, Limited, forty of these aircraft having been ordered by the Turkish Government.

Seaplane floats under repair in Winnipeg plant of the MacDonald Bros. Aircraft Limited. Here were manufactured 71 sets of "Edo" floats during the past year.

Engine assembly and complete overhaul facilities of the Canadian Pratt & Whitney Aircraft Company, Limited, at Longueuil, Que. Equipment for the repair and testing of Hamilton Standard adjustable, controllable-pitch and constant speed airscrews beyond partition.

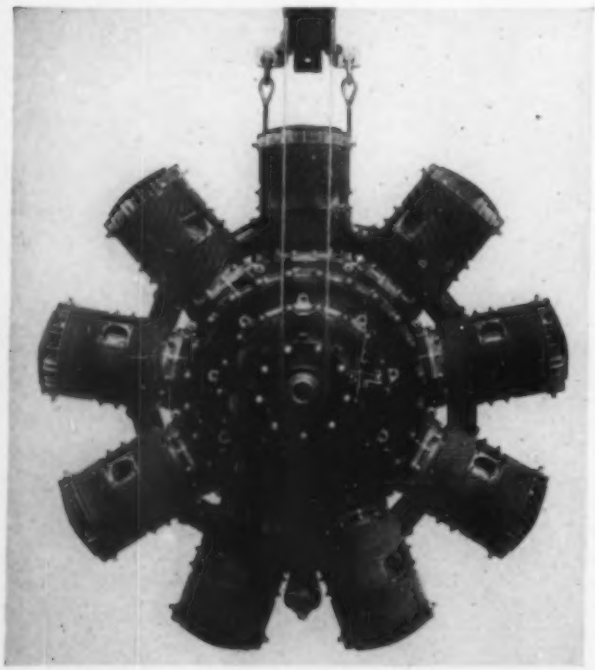
Wood-working division of the MacDonald Bros. Aircraft, Limited, in Winnipeg, where facilities are available for the manufacture o components, the plant being provided with a wide range of welding, power and hand equipment.

Aircraft, Limited, Cartierville, Que.; and the Ottawa Car Manufacturing Company, Limited, Ottawa. Montreal Aircraft Industries, Limited, Cartierville, Que., another member of the association, is not at present in production, though its plant is equipped to recommence manufacture.

Firms engaged in the assembly and development of aircraft engines are the Canadian Car & Foundry Company, Limited, Montreal; Canadian Pratt & Whitney Aircraft Company, Limited, Longueuil, Que.; Canadian Wright, Limited Montreal; de Havilland Aircraft of Canada, Limited, Downsview, Ont.; and the Ottawa Car Manufacturing Company, Limited, Ottawa. The Bristol Aeroplane Engines, Limited, Montreal, has facilities available for the overhaul, service and assembly of engines manufactured in England by the Bristol Aeroplane Company, Limited. The Standard Machine Works, in Winnipeg, are equipped for the complete overhaul of a number of commercial types of aircraft engine.

While not engaged in the actual manufacture of aircraft, MacDonald Bros. Aircraft, Limited, is actively engaged in the production of pontoons, ninety sets having been delivered last year. Of these, nineteen had to be brought in from the United States, however, due to the difficulty in securing delivery of materials; delayed at times for nine months. Equipment is installed for the manufacture of other aircraft components in large volume. Other firms, such as the Link Manufacturing Company, Limited, producing instrument trainers for Canada and the British Air Ministry at Gananoque, Ont., are closely associated with the aircraft industry in this country, and are associate members of the Commercial Air Transport and Manufacturers' Association of Canada.

Bristol "Perseus" nine-cylinder radial sleeve valve engine, with which it is proposed to power the Lysander aircraft ordered for the R.C.A.F. This engine is not at present being assembled in Canada.



Aircraft Building for R.C.A.F.

Manufacture of British-type aircraft for delivery to the Royal Canadian Air Force is necessarily shrouded in secrecy, as the companies concerned are responsible to the Canadian Government, and it in turn to the British Air Ministry for maintaining inviolate the special features incorporated. Craft in this category now under construction or on which production will start shortly, and similar to types now being built for the Royal Air Force are:

BLACKBURN "SHARK", seventeen of which are being built in Vancouver by the Boeing Aircraft of Canada, Limited. First put into production in 1935 for the R.A.F., and subsequently selected by the Portuguese Government as a coastal patrol and shipboard seaplane, the "Shark" is a two or three-place torpedo bomber, fleet-spotter or reconnaissance biplane, which can be operated from wheels or pontoons. The folding wings are staggered, spars of stainless steel, ribs of duralumin and fabric covered. The fuselage, of metal monocoque construction, is divided into two watertight compartments up to the cockpit coaming. Its armament consists of one fixed gun firing forward and one rear movable machine gun. A torpedo, weighing 1,500 pounds, can be carried in crutches below the fuselage or an equivalent weight of bombs in carriers below the bottom wings. Powered with an Armstrong Siddeley "Tiger" fourteen-cylinder radial air-cooled engine, it has a maximum speed of 152½ m.p.h. at 5,500 feet, a service ceiling of 16,400 feet and a cruising range of 550 miles. An alternative engine is the Bristol "Pegasus IX" nine-cylinder radial air-cooled engine.

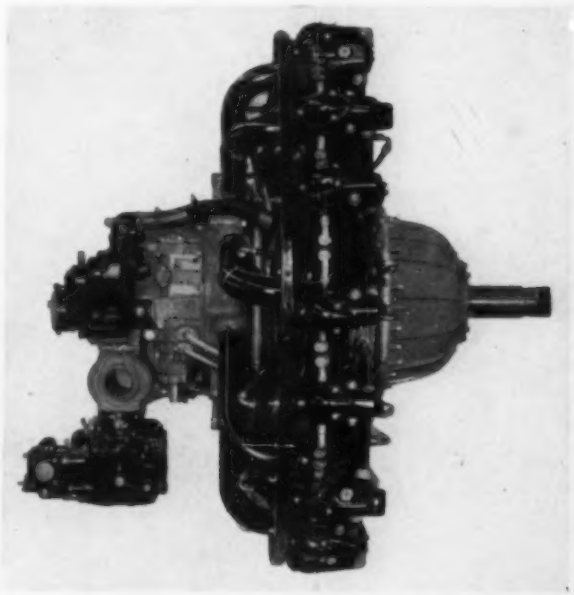
BRISTOL "BLENHEIM", eighteen of which are being built at Longueuil, Que., by the Fairchild Aircraft, Limited. Large orders for this high performance, twin-engined day bomber were placed by the

Air Ministry in 1936, and the machine was in full production last year. The single wing is built in three sections, the centre being bolted and riveted to the fuselage. The spars consist of two heavy high-tensile steel flanges, with a light single-plate "Alclad" web between them, and the ribs are made of "Alclad" sheets, of which duralumin is the principal constituent. The Alclad stressed-skin covering is riveted to the spar flanges and ribs. The fuselage, built in three sections, is of light alloy monocoque construction with an Alclad sheet covering. The under-carriage is retractable to the rear, full indication and warning signal devices of a visible, audible and mechanical character being provided. The pilot is seated in the nose and the navigator alongside. The armament consists of one forward-firing gun in the port wing and one gun in a retractable hydraulically-operated turret located aft of the wing, mounted midway along the top of the fuselage. All bombs are carried internally in a bomb cell under the centre section. Lighting, radio, photographic, navigation and oxygen equipment is carried. The power plant consists of two Bristol "Mercury VIII" nine-cylinder radial air-cooled engines, located in nacelles attached to the extremities of the centre section. The maximum speed of this aircraft of 279 m.p.h. is attained at 15,000 feet, to which it can climb in 8.8 minutes. The service ceiling is 30,000 feet, when fully loaded to 11,700 pounds, and its range at 200 m.p.h. is approximately 1,000 miles. An even higher performance is anticipated for this aircraft. The contract, awarded on a "cost-plus" basis, is in the vicinity of $1,500,000, and should be filled by the end of 1941. The Canadian version of the "Blenheim" will be convertible for operation as a seaplane or from skiis, and the type was selected as being the fastest aircraft of its kind in the world.

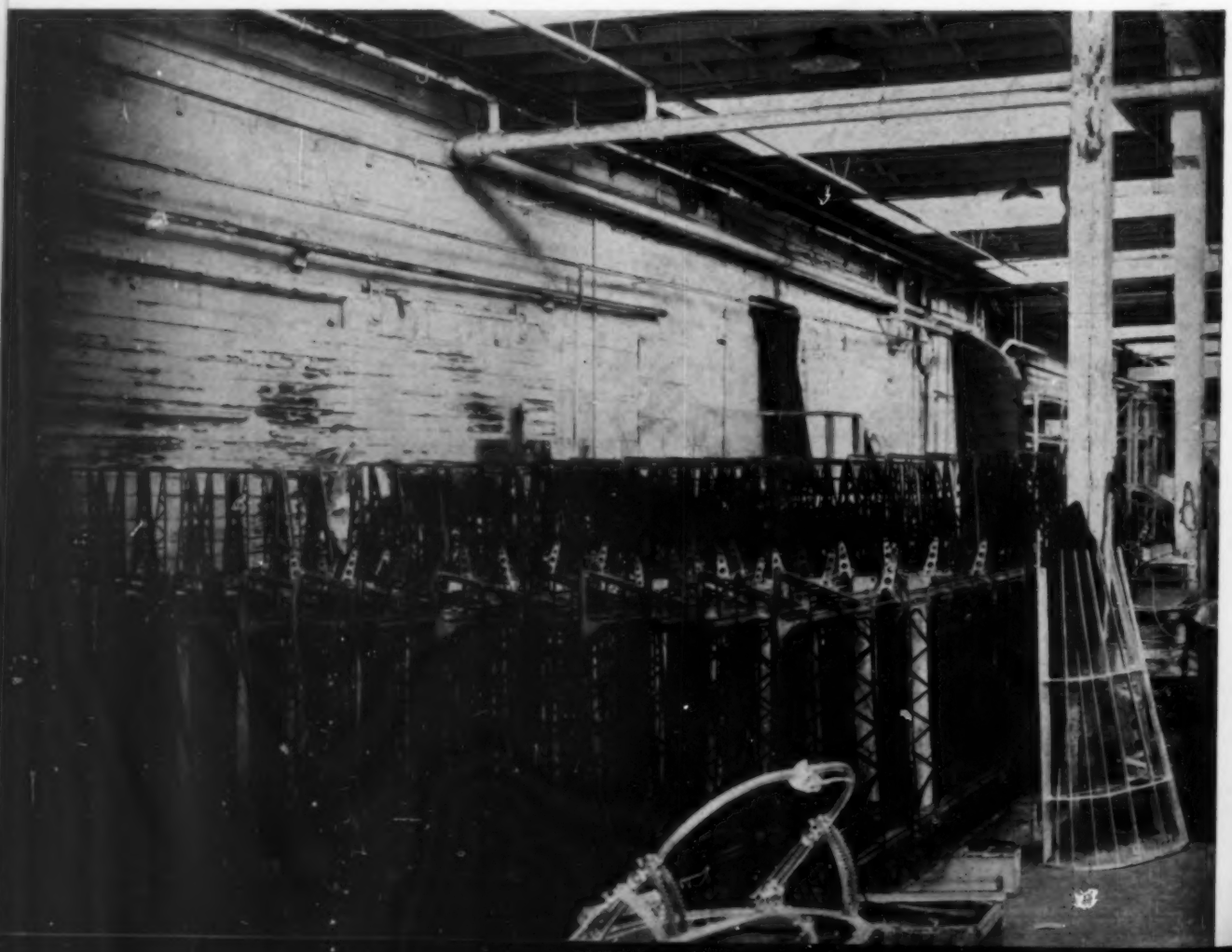
SUPERMARINE "STRANRAER", ten of which are being built in Montreal by Canadian Vickers, Limited. This twin-engined long distance reconnaissance and bombing flying boat was in full production in 1936. The biplane wings are of unequal span, the centre section being carried above the hull by played out struts supporting the engine nacelles. The wing structure is of "Alclad" and stainless steel, the whole being covered with fabric. The typical Supermarine two-step hull is of Alclad, with the principal fittings of stainless steel, the whole being covered with smooth Alclad plating. A bombing and gunnery station is located in the bow. Immediately aft of the pilot's cockpit, fitted with dual controls, and forward of the front spar frame is accommodation for a navigator. Between the spar frames are the wireless operator's and engineer's positions. Aft of the wings is the midship gun position, and another gun position is located in the extreme tail. Provision is made for sleeping quarters, food and water storage, a cooking galley, and the carriage of sundry maintenance equipment, such as a spare airscrew and an inspection platform, in addition to the collapsible dinghy, which renders operations distant from the "home" base a practical feature of the aircraft's performance characteristics. Powered with two Bristol "Pegasus X" nine-cylinder radial air-cooled engines, the "Stranraer" has a maximum speed of 165 m.p.h. at 6,000 feet. The service ceiling is 18,500 feet, when fully loaded to 19,000 pounds, and the cruising range is estimated at 1,000 miles.

WESTLAND "LYSANDER", twenty-eight of which will be built by the aircraft division of the National Steel Car Corporation, Limited, which is completing at Malton, site of the new Toronto terminal airport, a plant for the manufacture of these and additional aircraft for which substantial orders are anticipated. This

Pratt & Whitney "H" Wasp engine with automatic carburetor. Used extensively in Canada, it has a normal rating of 550 h.p. at 2200 r.p.m. at 8,000 feet. This engine is assembled in Canada.



single-engined two-seat army co-operation high-wing monoplane represents the result of many years' experience secured by army co-operation pilots, and is now in quantity production for the Royal Air Force. The cockpit is located in front of and level with the leading edge of the wings, which provides the pilot with an exceptional view desirable for spotter and reconnaissance duties. Since this type of aircraft is often obliged to operate from temporary and confined landing grounds, the Lysander has been given a remarkably quick take-off, a low landing speed and a steep climb. The wings incorporate Handley Page wing tip and root slots and trailing edge slotted flaps whose operation is entirely automatic, which assists in the retention of control at slow speeds, necessary for spotter-reconnaissance and camera duties. Cabin heating, independently controlled by pilot or observer, is supplied by fresh air warmed in transit round the oil coolers. Extruded sections of light alloy have been used extensively in the construction of this aircraft, which is somewhat unorthodox. The wing structure consists of a substantial front spar, metal-covered to the leading edge, a light tubular rear spar and fabric covering from the front spar to the trailing edge. The fuselage consists of rectangular metal framework, faired to an oval section, covered with fabric. Two machine guns are mounted in the nose of the streamline wheel casings, above the landing lights, and a third in the observer's cockpit. When used as a bomber, two small stub wings may be bolted to the undercarriage for the transport and easy release of bombs. Powered with a Bristol "Mercury XII" nine-cylinder radial air-cooled engine, the Lysander attains a maximum speed of 229 m.p.h. at 10,000 feet. Its service ceiling, that height at which the rate of climb has dropped to 100 feet per minute, is 26,000 feet, and gross weight 5,920 pounds. It is expected these aircraft will be powered with the new Bristol "Perseus XII" sleeve valve engine, the maximum output of which is 905 horse-

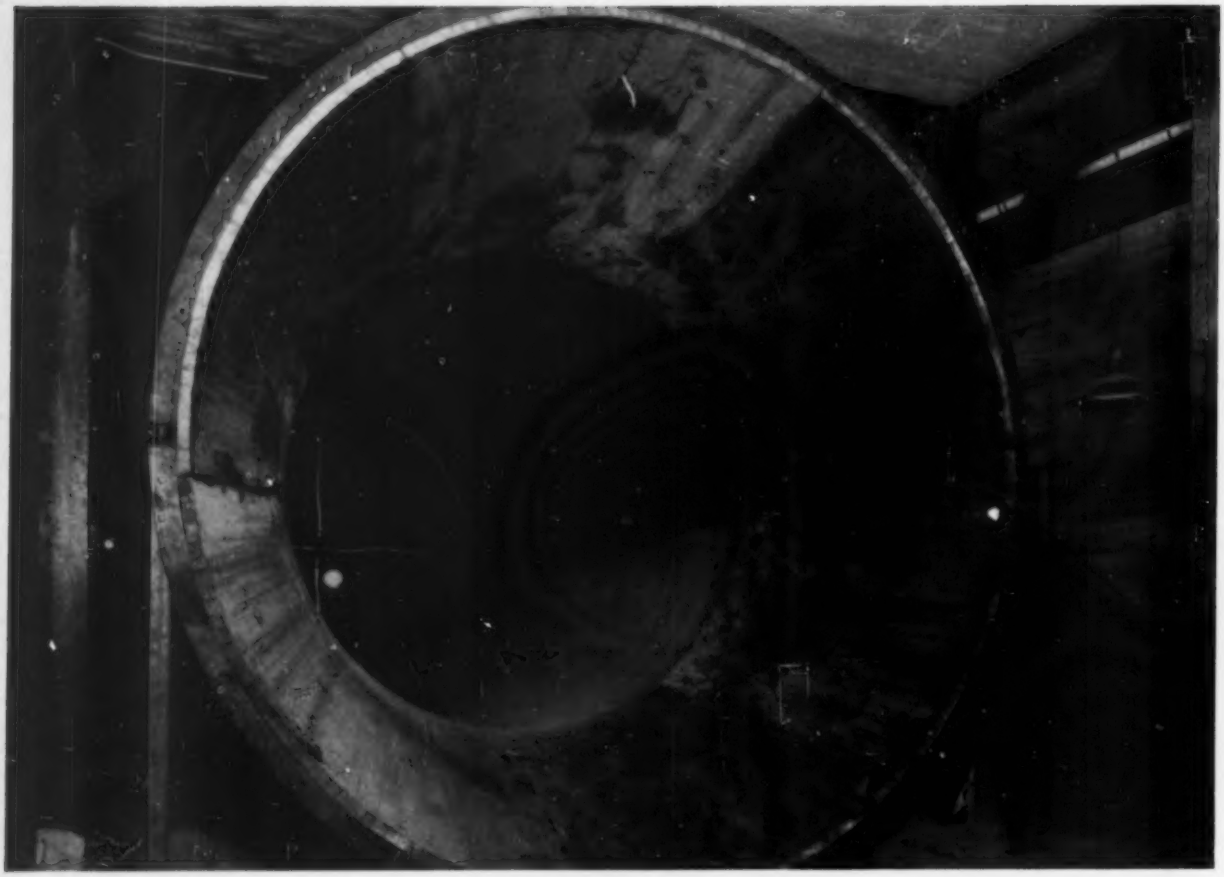


power at 6,500 feet. Great Britain is the only country in the world producing these engines, advantages claimed for which are less noise, lower fuel consumption, easier maintenance, fewer and simpler component parts, reduced weight, minimized risk of fire and simpler manufacture. The Guggenheim Gold Medal for 1938, awarded annually for the most outstanding contribution to aeronautical progress, went to Mr. A. H. R. Fedden, who perfected the design of this engine.

Thirteen NORTHRUP "DELTA" metal monoplanes, designed in the United States and found suitable for high-speed photographic survey work, are being built by Canadian Vickers, Limited, for delivery to the Department of National Defence. Seven of an earlier type were supplied in 1936, and equipped with floats and skiis. Certain modifications were incorporated to meet Canadian climatic and other conditions, such as a large freight door, just aft of the wing trailing edge, to facilitate the loading of cameras and other cargo. Powered with a Wright "Cyclone F.52" engine, rated at 640 h.p., the Delta has a maximum speed, as a seaplane, of 180 m.p.h. at 8,000 feet. Its service ceiling is 19,800 feet. The "Delta" also has a potential military value.

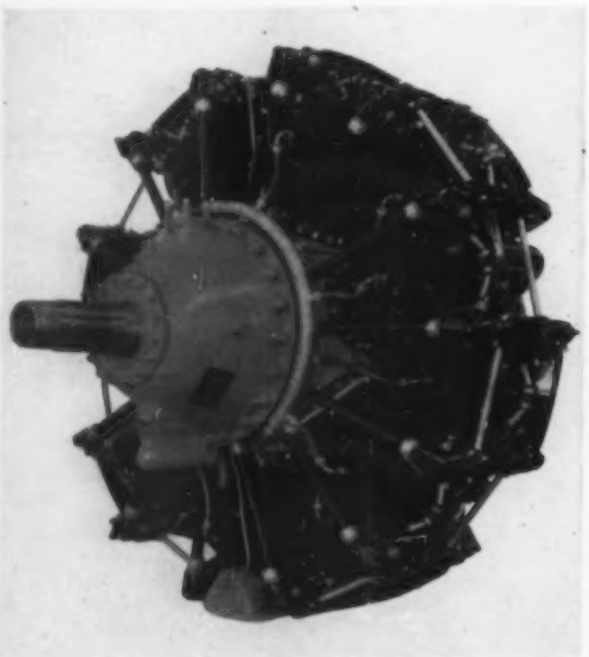
Delivery has been made recently to the R.C.A.F. of twenty-five Tiger Moth Trainers, these being the first aircraft completely manufactured by the de Havilland Aircraft of Canada, Limited. An order has been filled by the Noorduyn Aircraft, Limited, for four "Norseman" high-wing monoplanes; and eight Fleet Trainers have been supplied to the Depart-

Airframes, showing engine mounts, in course of assembly by Ottawa Car Manufacturing Company, Limited, engaged since 1929 in building the Avro "504", Avro Avian, Avro Tutor and the Avro "626" Trainer. Aircraft reconditioned in this plant during the last thirteen years include the Armstrong Whitworth Atlas and Siskin and the Westland Wapiti. On the left are a number of metal wings, indicating character of rib structure.



Collecting bell and propeller of wind tunnel in laboratories of National Research Council at Ottawa. Through this can be forced a nine-foot diameter jet of air at 160 m.p.h.

ment of National Defence by the Fleet Aircraft, Limited, bringing the total of the above-mentioned orders to that department to 123. In addition, the Ottawa Car Manufacturing Company, Limited, is completely reconditioning eighteen Wapiti, three Atlas, and one Avro Tutor aircraft, and is engaged on the assembly of nine new Avro "626" Trainers.

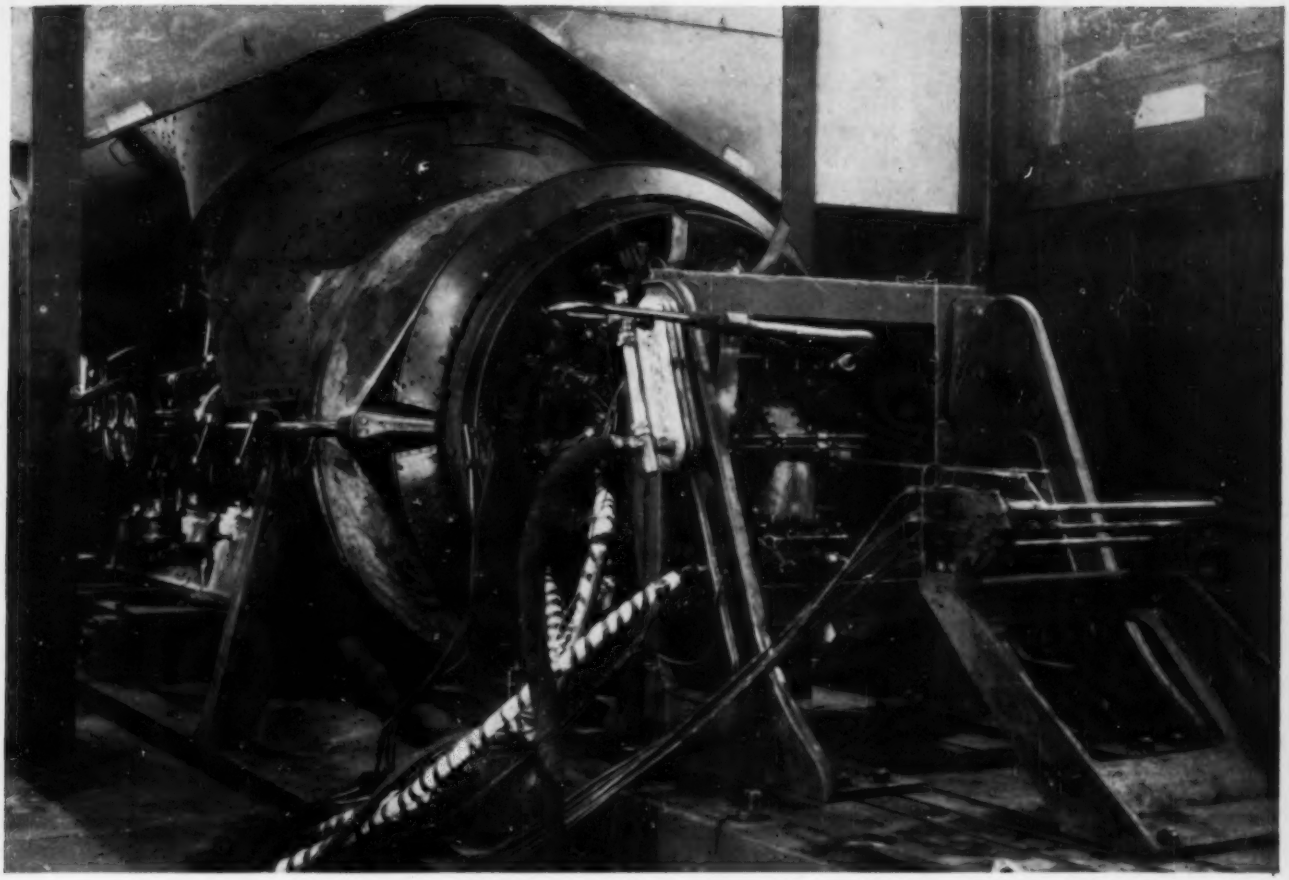


Pratt & Whitney "Twin Wasp" engine, which develops 1050 h.p. with 87 octane fuel.

Mention should be made at this time of the recent completion by the Canadian Car & Foundry Company, Limited, of forty Grumman "FF-1" two-seat fighters for the Turkish Government at its Fort William plant. This biplane, which is standard equipment for the United States Navy, is powered with one Wright "Cyclone SR-1820-F" motor, which provides for a maximum speed of 216 m.p.h. at 5,300 feet. Its service ceiling is 22,500 feet, and its cruising range 647 miles. The two-wheel retractable type undercarriage is withdrawn into recesses in the side of the fuselage. A single-seat fighter, of an original design, is now being built for delivery in September.

Many Types Built in Canada.

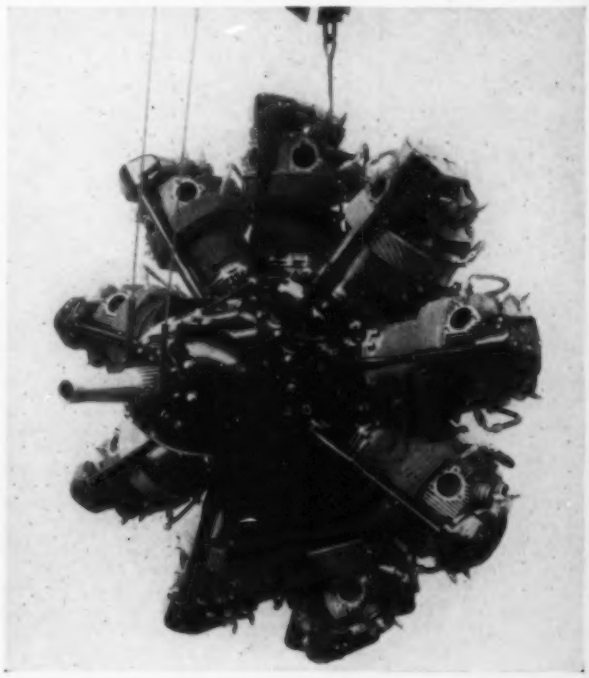
Many different types of aircraft have made their appearance in Canada during the last fifteen years, some of these having



Armstrong Siddeley fourteen-cylinder "Jaguar" engine, undergoing fuel investigation on the dynamometer in laboratories of National Research Council at Ottawa.

been designed for the transportation of freight, training purposes, aerial survey and photographic duties, forest patrols and fire suppression, while others of proven designs in other lands have been manufactured or assembled in this country. Geographical and climatic conditions have exercised remarkable influences on the industry, and special equipment has been developed as a result of vast experience gathered by as fine an aggregation of pilots and operators as may be found in any part of the world. Commencing with its pioneer "Vedette", Canadian Vickers have designed and built the Varuna, Vancouver, Vanessa, Vigil and Vista, manufactured the Viking, Fairchild "F.C.2" (previous to 1929), the Avro, Fokker Super-Universal and Bellanca Pacemaker, total deliveries to date being 183 aircraft.

Established in 1928, the de Havilland Aircraft of Canada, Limited, is responsible for the assembly of 325 "Moth" planes, historically famous as trainers, many of these having been furnished to light aeroplane clubs. One of 34 Puss Moths built by this firm was flown by "Bert" Hinkler from Toronto to England, via the South Atlantic, and was the first machine assembled in this country to reach Europe under its own power. Other



Bristol "Mercury" nine-cylinder radial air-cooled engine, with which "Blenheim" bombers being built in Canada for the R.C.A.F. will be powered.

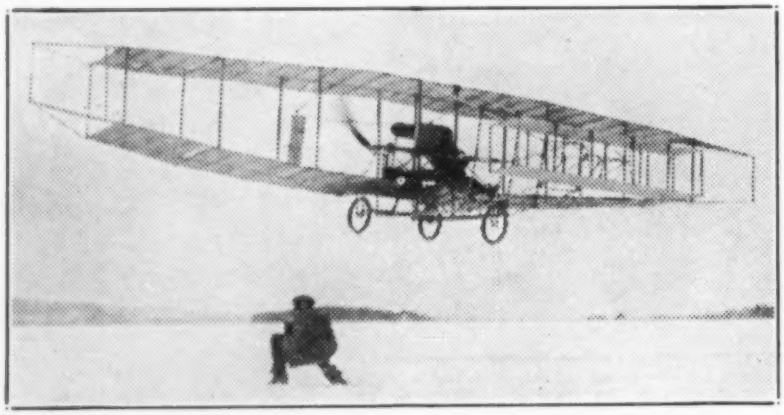
types built outside Toronto are the Fox Moth, Hornet Moth, Hawk Moth, Tiger Moth, Dragon, Dragonfly and the Rapide, the total production amounting to 419 aircraft.

Incorporated in 1928, the Reid Aircraft Company designed the "Rambler", and, as the Curtiss-Reid Aircraft Company, Limited (now the Montreal Aircraft Industries, Limited), built this and the "Courier". Commencing operations early in 1929, the Ottawa Car Manufacturing Company, Limited, assembled the Avro "504", Avro "Avian", Avro "Tutor" and the Avro "626" Trainer. During the four previous years, this firm reconditioned aircraft.

The Fairchild Aircraft, Limited, was created early in 1929, and has built the following types: Fairchild "71", "71-B", "71-C", "K.R.22", "51/71", and developed for Canadian conditions the Fairchild "Super 71", "Super 71-P", "82" and the Sekani. Besides its aerodrome, with four intersecting runways, this firm has a seaplane harbour adjoining its plant.

Formed early in the summer of 1929, the Boeing Aircraft of Canada, Limited, has manufactured the Boeing "40-H4", and developed a new type of flying boat. The Fleet Aircraft, Limited, incorporated in March, 1930, as the Fleet Aircraft of Canada, Limited, has manufactured and assembled a total of 321 aeroplanes, a number of which have been exported to foreign lands. These include the Fleet Trainer, the Canadian Waco and the Fleet Freighter, which spread its wings for the first time last March. The Noorduyn Aircraft, Limited, commenced operations in May, 1935, when the "Norseman" was produced, having been specially designed to meet the requirements of commercial operators, and following an extensive survey of conditions and opinions throughout the Dominion. The Cub Aircraft Corporation, Limited, is engaged in the production of a low-powered sport model, known as the "Cub Sport J-3", which is also used as a primary trainer.

A remarkable range of aircraft engines have been assembled and serviced in Canada, such as the Pratt & Whitney "Wasp Junior", "Wasp" and "Hornet", by the Canadian Pratt & Whitney Aircraft Company, Limited, which also services the Hamilton Standard adjustable, controllable-pitch and constant speed airscrew. Others are the Wright "Whirlwind" and "Cyclone", by the Canadian Wright, Limited, and the Bristol "Jupiter", by the Bristol Engines of Canada, Limited, these two firms having



Courtesy of The Gazette (Montreal)

FIRST AEROPLANE FLIGHT IN BRITISH EMPIRE

"Aerodrome" Silver Dart, with John Douglas McCurdy at the controls, descending on the ice at Baddeck, Nova Scotia, on February 23, 1909, having completed a flight of half-an-hour over the Bras d'Or Lakes, and the first by a heavier-than-air machine in the British Empire. Two months later, on May 2, J. T. C. Moore-Brabazon made at Eastchurch the first flight in the British Isles, and is credited by the Royal Aero Club with being the Empire's premier pilot on the strength of that achievement. The flimsy structure of this machine presents a striking contrast to that of modern bombers, fighters and pursuit planes, and in particular to such huge passenger ships as the 82,500-pound Boeing "314", the 65,000 -pound Douglas "DC-4", the 48,000-pound Junkers "JU-90" and the 46,500-pound Armstrong Whitworth "Ensign".

been associated at one time under the name of Aero Engines of Canada, Limited, a holding company. Armstrong Siddeley Motors, Limited, associated with the Ottawa Car Manufacturing Company, Limited, assembled and serviced the Armstrong Siddeley "Genet", "Genet Major", "Civet", Mongoose", "Lynx", "Serval", "Jaguar", "Cheetah" and "Tiger". The Canadian Car & Foundry Company, Limited, has commenced manufacture of a radial air-cooled engine of approximately 200 h.p.

The Bristol "Jupiter" was the first high powered air-cooled aero engine to pass successfully the Air Ministry's official type test, this being in September, 1921. Nine months later the Armstrong Siddeley "Jaguar" completed a similar type test.

The foregoing facts provide some conception of the capacity and facilities available in Canada for the manufacture of the most modern aircraft, necessitating high precision work by fully skilled and semi-skilled labour. No attempt has been made to trace the steady development of the industry during the last fifteen years, in times of prosperity and times of deepest depression. Recognition now comes to those men of courage and confidence in the future who made possible the construction of aircraft suitable for operation under most difficult conditions far beyond the bands of steel that traverse the continent, and without which the development of mining, the most progressive industry in this Dominion, would have been long delayed. The promotion of peace will be to them a double-edged sword.

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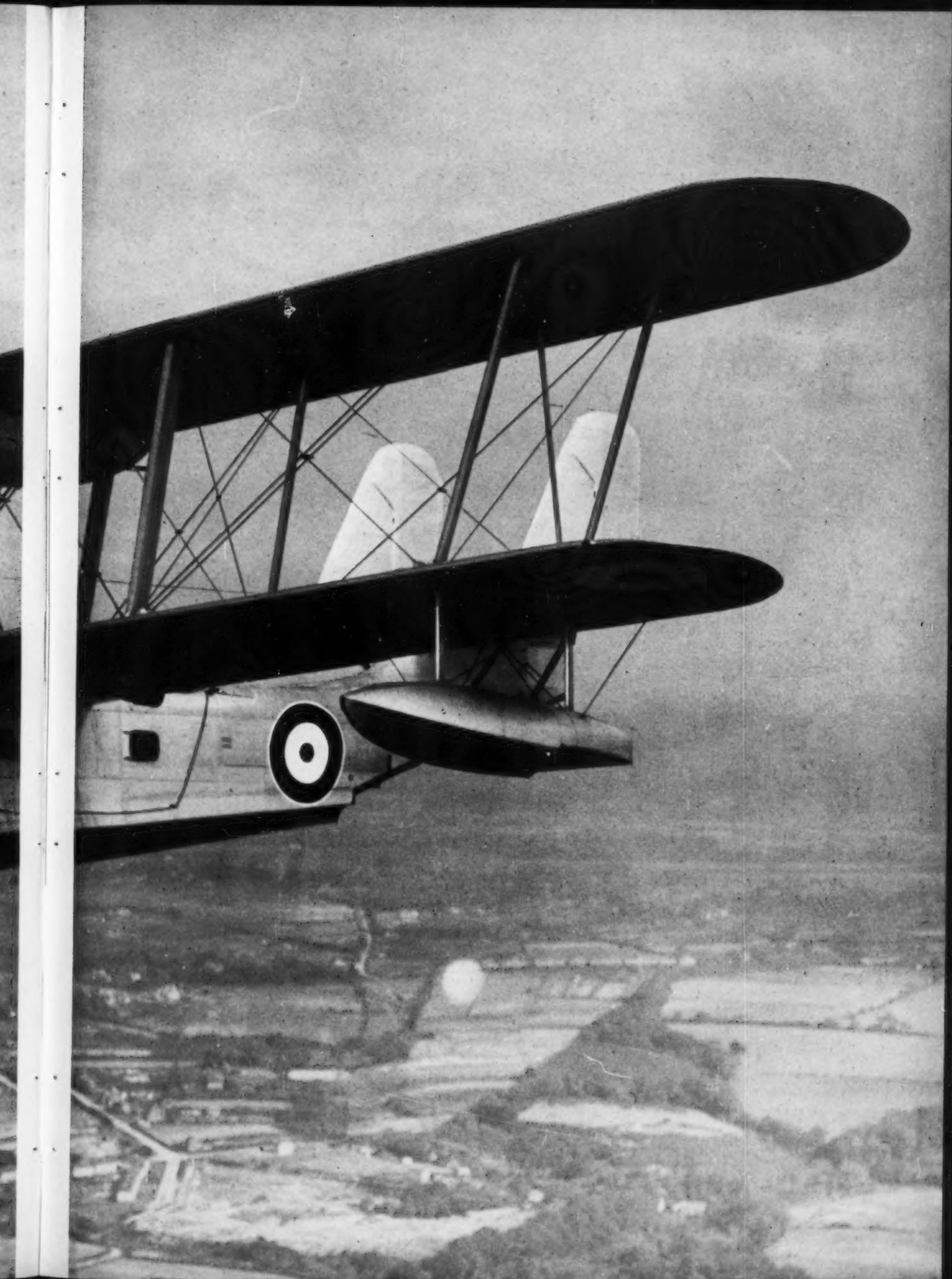
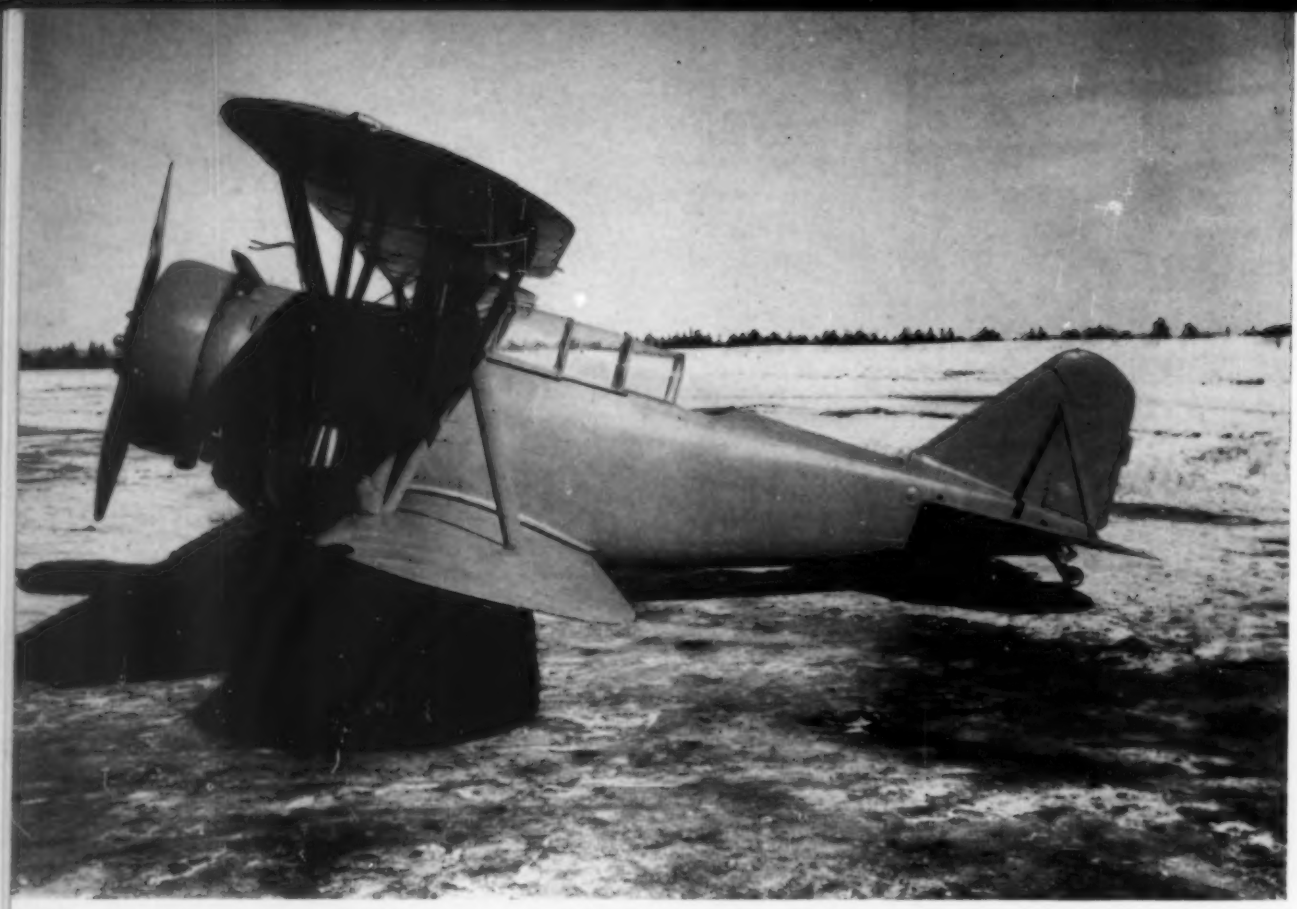
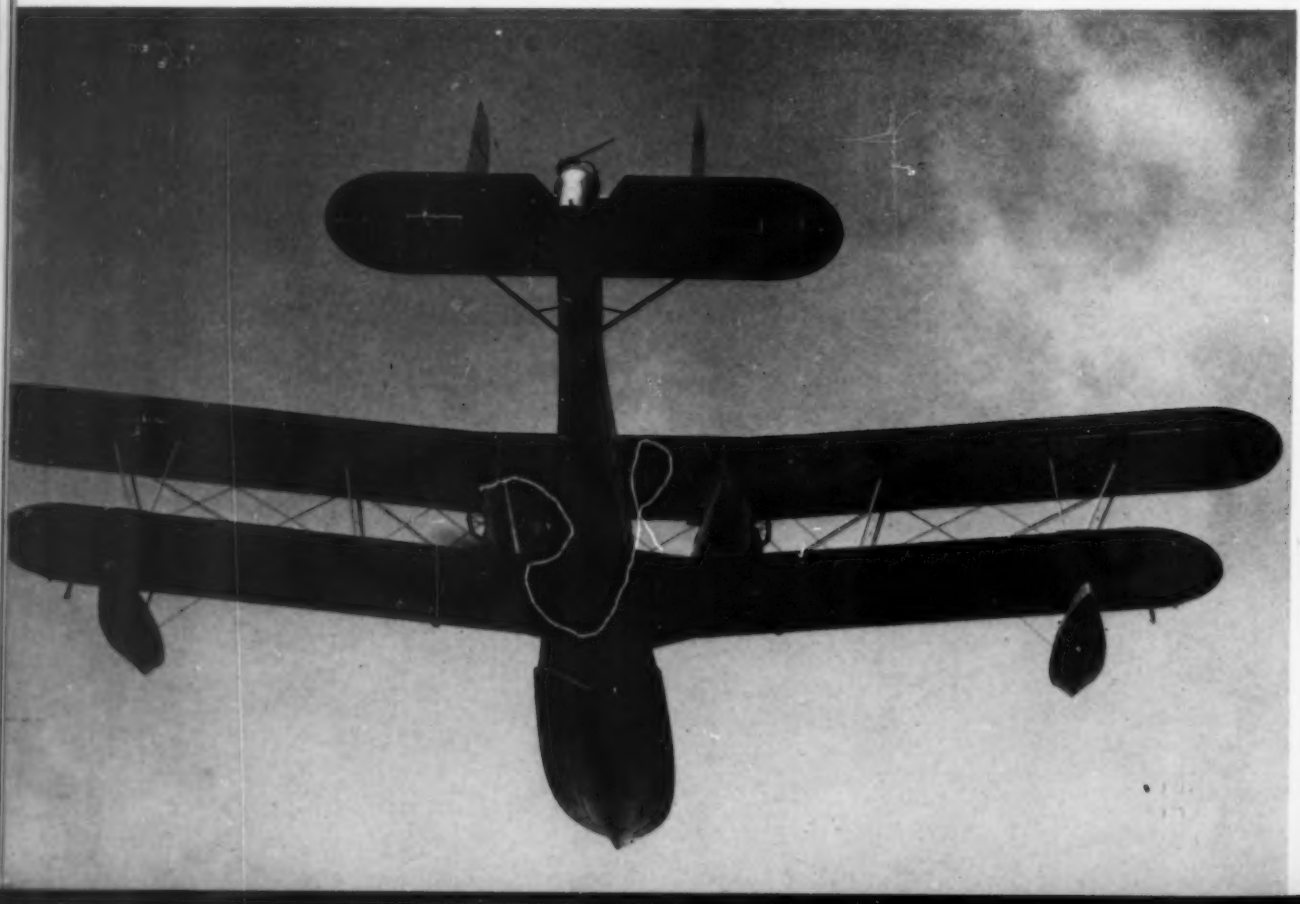
Bibliography:—Credit is due the following organizations for much of the information set forth in the above article: Department of National Defence; Department of Transport; National Research Council; Dominion Bureau of Statistics; Commercial Air Transport & Manufacturers' Association of Canada; Society of British Aircraft Constructors, Limited; Aluminum Company of Canada, Limited; British Aeroplane Engines, Limited; Canadian Airways, Limited; Canadian Aviation; Canadian Car & Foundry Company, Limited; Canadian Pratt & Whitney Aircraft Co., Limited; Canadian Vickers, Limited; Canadian Wright, Limited; Cub Aircraft Corporation, Limited; de Havilland Aircraft of Canada, Limited; Fairchild Aircraft, Limited; Fleet Aircraft, Limited; MacDonald Bros. Aircraft, Limited; National Steel Car Corporation, Limited; Ottawa Car Manufacturing Company, Limited, and the Royal Canadian Air Force.





Grumman two-seat fighter, forty of which were ordered by the Turkish Government for assembly at Fort William, Ont., by the Canadian Car & Foundry Company, Limited. Standard equipment in the United States Navy, it has a speed of 216 m.p.h. at 5,300 feet.

Supermarine "Stranraer" flying boat, as seen from below, indicating streamline design and location of tail gun position. Ten of these aircraft are being built by Canadian Vickers, Limited, Montreal, for the R.C.A.F.



Blackburn "Shark" two or three-seat torpedo bomber, fleet spotter or reconnaissance biplane with folding wings. An order for seventeen of these aircraft has been placed with the Boeing Aircraft of Canada, Limited, Vancouver, for the R.C.A.F.

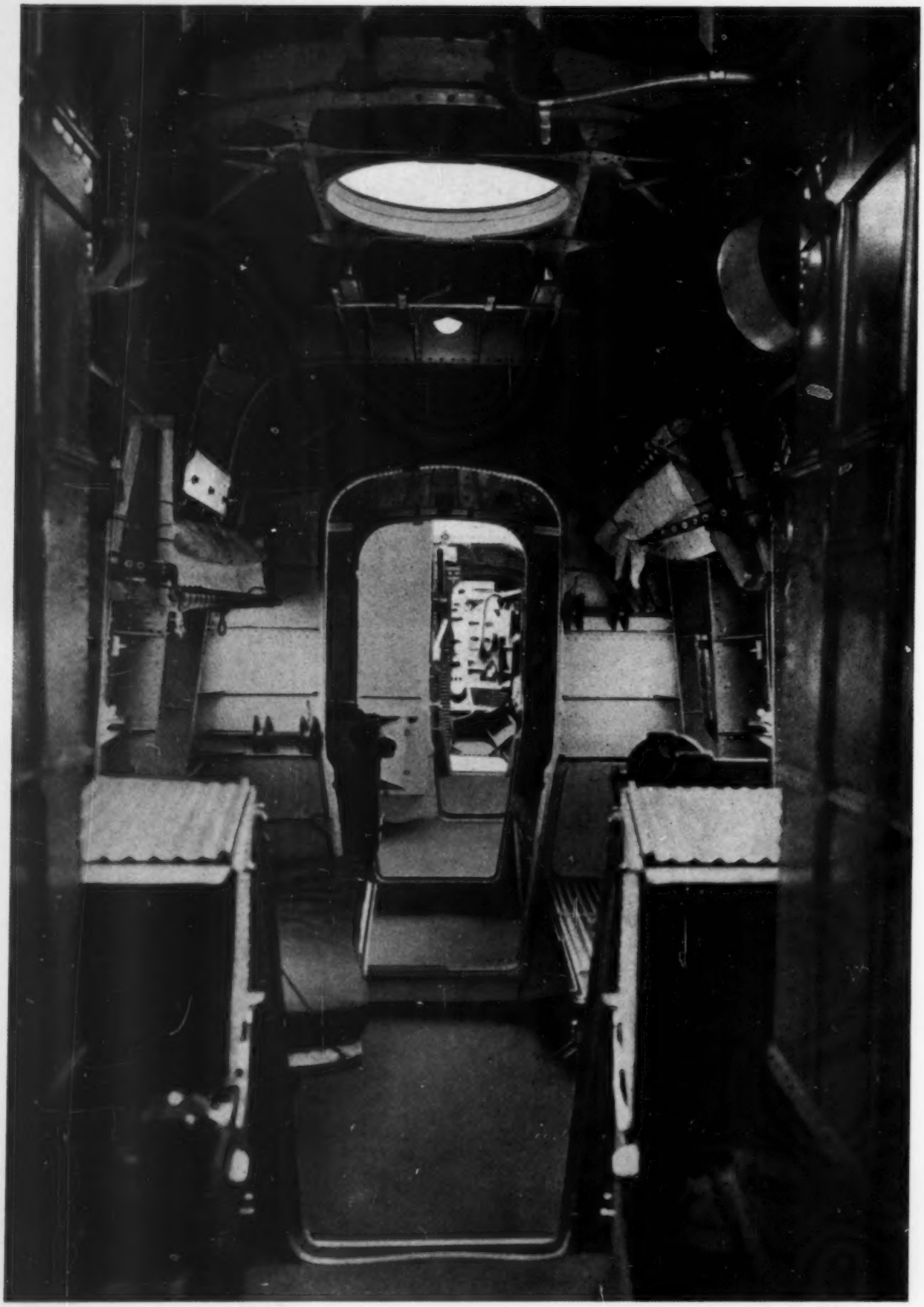
"Norseman", designed to meet the special requirements of Canadian operators and built by the Noorduyn Aircraft, Limited, Cartierville, Que. Four aircraft of this type were recently delivered to the R.C.A.F. for general training purposes.

Fairchild "Super 71", developed for Canadian conditions and manufactured at Longueuil, Que., by the Fairchild Aircraft, Limited. This particular plane was delivered to the R.C.A.F.

"Tiger Moth" Trainer, manufactured at Downsview, Ont. (near Toronto) by the de Havilland Aircraft of Canada, Limited. Twenty-five of these aircraft were recently completed for delivery to the R.C.A.F.

Bristol "Blenheim", a high performance, twin-engined day bomber, an order for eighteen of which has been placed with the Fairchild Aircraft, Limited, by the Department of National Defence. The maximum speed of this aircraft is 279 m.p.h. at 15,000 feet. The armament consists of one forward-firing gun in the port wing and another in a retractable gun turret.

Fairchild "82", developed for Canadian conditions and manufactured at Longueuil, Que., by the Fairchild Aircraft, Limited. The fuselage is of steel tubing, fabric covered, while the wings consist of spruce box spars and ribs, fabric covered.



Spacious interior of Supermarine "Stanraer" twin-engined long distance reconnaissance flying boat, ten of which are under construction in the Montreal plant of Canadian Vickers, Limited. (LEFT) In the bow is located the bombing and gunnery station, behind which is the pilot's enclosed compartment with seating for two and dual controls. Aft of this "cockpit" is accommodation for the navigator,

and between the spar frames for the engineer and wireless operator. Provision is made for sleeping quarters, food and water storage, a cooking galley and the carriage of sundry maintenance equipment, which renders operations distant from the home base a practical feature of this aircraft. (RIGHT) View looking towards the stern, where is located a lavatory and the tail gun position. Aircraft of this character are now being built in Britain for the R.A.F., and will shortly be placed in service.

LAKE OF THE WOODS IS CALLING YOU!

by **CHARLES CLAY**

CANADA is calling the American tourist! More particularly, Canada's turquoise lakes in their emerald settings of evergreen forests, are calling the American tourist. And of all these north country waterways, few have the magnificence, the beauty, the irresistible magnetism, of the storied Lake of the Woods!

Here are two thousand square miles of sheeny, limpid, beckoning waters. Here are hundreds of quiet, broodingly mysterious bays calling to the tired business men of this continent. Here are fourteen thousand island jewels in whose glades sing the feathered choristers of nature. On every hand are beauty and splendour and peace and immemorial calm — a conspiracy of illimitable treasure, eager to yield up its wealth to the vacationist!

Nor does that exaggerate. Indeed, it understates. The Lake of the Woods area, ninety miles in length and sixty in width, is not only the largest resort area in Northwestern Ontario; it is also one of the most exciting in its holiday possibilities, in the whole of Canada. Here is scenic appeal, historic interest, sporting allure; and here is curious attraction, as an example of modern-world anomaly.

For this area, long the forest-fastness home of the Indian, is now a playground of the White Man. Yet the Indian persists. On all sides there is evidence of him — primitive encampments, ingenious implements of the simple life, and the dusky cheerful nomad himself. While right in incongruous juxtaposition to birch bark canoe steams a beautiful yacht worth $80,000; across a bay from a teepee town glitters a modern summer palace, and in the same fish-heaven channel rocks a dirty rowboat in which sits an Indian lad landing his fish with a ten-cent line and ten-cent spinner, not far from a gleaming launch and a linen-clad sportsman landing his catch with a five-dollar rod and accessories! That is the Lake of the Woods area, and that anomaly gives it some of its charm for seeing eyes.

But its charm is as varied as the lights and shades glinting on its fabled waters. At every point of the compass there are storied spots. In one direction lies Wetako Island, inhabited by weird Indian devils. In another direction lies Sioux Lookout, where the last bloody battle between Ojibway and Sioux was fought, when Ojibway warriors ambushed Sioux braves they discovered swimming across a narrows. In still another direction lies Yellow Girl Island, on which, in ancient times, stood a mysterious yellow-haired girl sentinel to warn Ojibways of approaching Sioux. These are but a few of the historic places to be visited in gay picnic groups in comfortable cabined power-boats; or to be visited in solitude by canoe, so that the mind can brood in peace upon the heroic events of another age.

And one cannot help but see the curious and mystical Devil's Rock in Devil's Gap, for that channel is a travelled thoroughfare.. The rock, a mammoth glacially deposited granite boulder, is an object of unique interest; for its sloping surface, years without number, has carried a grotesque bizarre satanic painted face. Eyes, nose, moustache, goatee, are added to a natural mouth-like gash in the rock itself. The effect is striking. It is startling. But that is not the really curious part. The mystery is, no one knows who paints that face! For every spring, just as the ice is going sea-ward, a morning dawns with the rock gleaming in fresh paint — applied by some supernatural hand! The Indians say that during the night legendary Wesukachak, an heroic man prominent in Indian mythology, did the job as a trick to show off his powers!

It is clear then, that the Indian allure of the Lake of the Woods is boundless. And little less so is the allure of the White Man's more than two-hundred-year sojourn in these parts. The fur trade, the lumber trade, and now the mining trade — the white settlements on the Lake of the Woods have come and gone. It was in

UPPER LEFT:— ". . . Devil's Gap Bungalow Camp, high up on a rocky pinnacle . . ."

LOWER LEFT:— ". . . a heaven-sent angling paradise . . ."

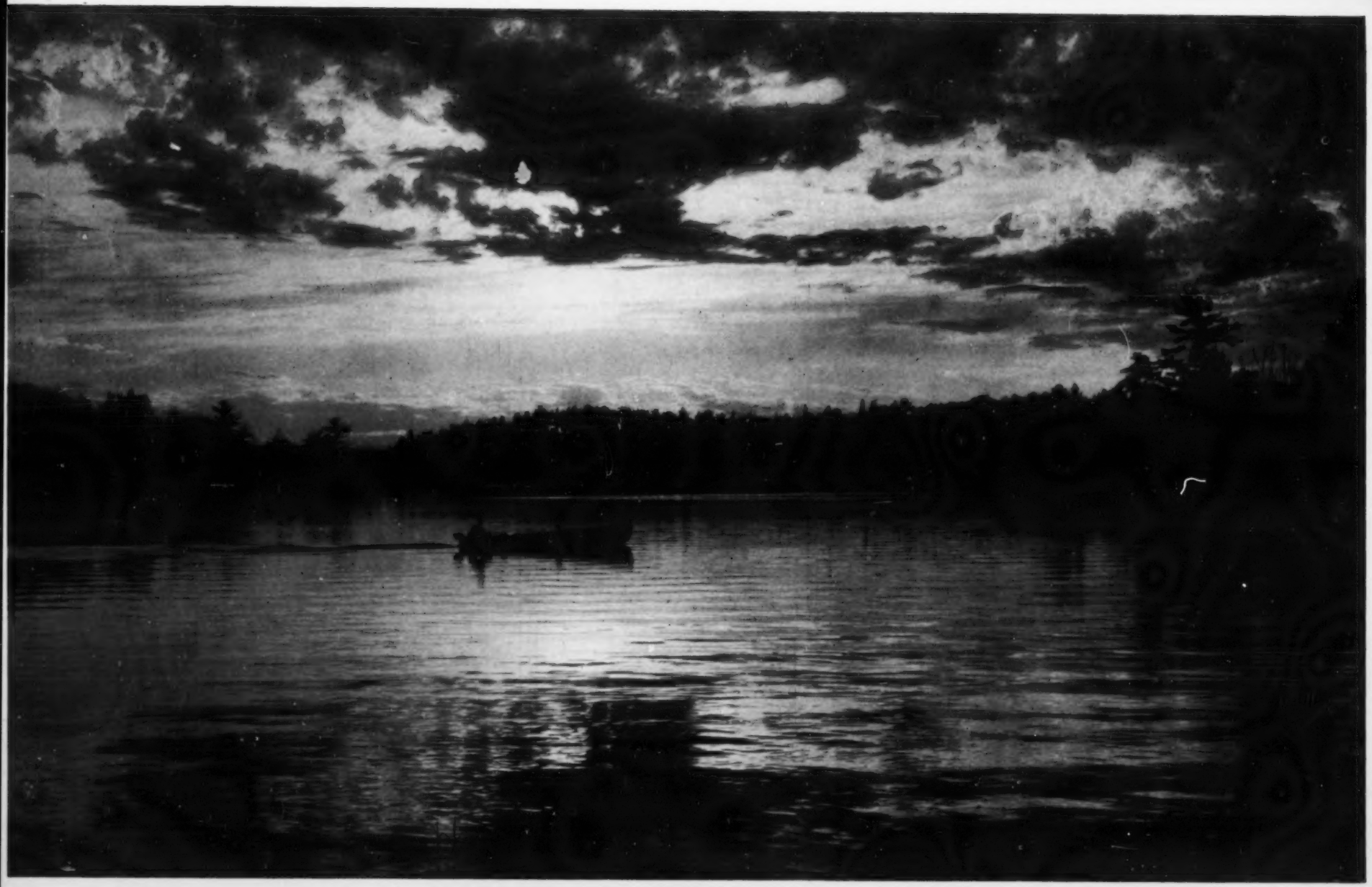
1731 that Sieur Pierre Gauthier de la Verendrye first launched his birch bark canoe into these waters. He built his Fort Charles in what is now the Northwest Angle. Since then, after a hundred and fifty years of fur trade and exploration, the tale has been varied and exciting. Shortly after the Canadian Pacific Railway passed through the area, a lumbering boom, with log drives and saw-mills, came; there are still evidences of it. Just before the Klondike rush, Lake of the Woods struck gold; and today some of Northwestern Ontario's small but prosperous mines are in its area. Bustling Kenora, on the very banks of the lake, is gay with that prosperity.

This, then, is the background of the paradise that is calling the American tourist. And along these happy shores, far from the fitful clash of the gears of business, he can holiday as he wills. He can hire canoe, pack his outfit, and depart into the island-flecked solitary waters. Or he can make his headquarters at Devil's Gap Bungalow Camp, three miles from Kenora, high up on a rocky pinnacle, and in that camp he can exist like the much-popularized Riley, because it can be the pivotal point of a perfect holiday; the utter privacy of his own bungalow can be traded for golf on a nearby course, for trips on a palatial yacht, for fishing togs and those mysterious far-beckoning bays.

That is the sheerest joy of Devil's Gap Bungalow Camp — one hour from its city comforts takes the vacationist to splendidly primitive nature, where the fishing is unexcelled! Indeed, sportsmen from all parts of the world come to pit their skill against the great muskies, the lake trout, the wall-eyed pike, the northern pike, the black bass, that lurk in the silent reaches of these waters. They provide a heaven-sent angling paradise! And in season, if one holidays late enough, there are red deer and moose to be stalked across the leaf-strewn forest floors.

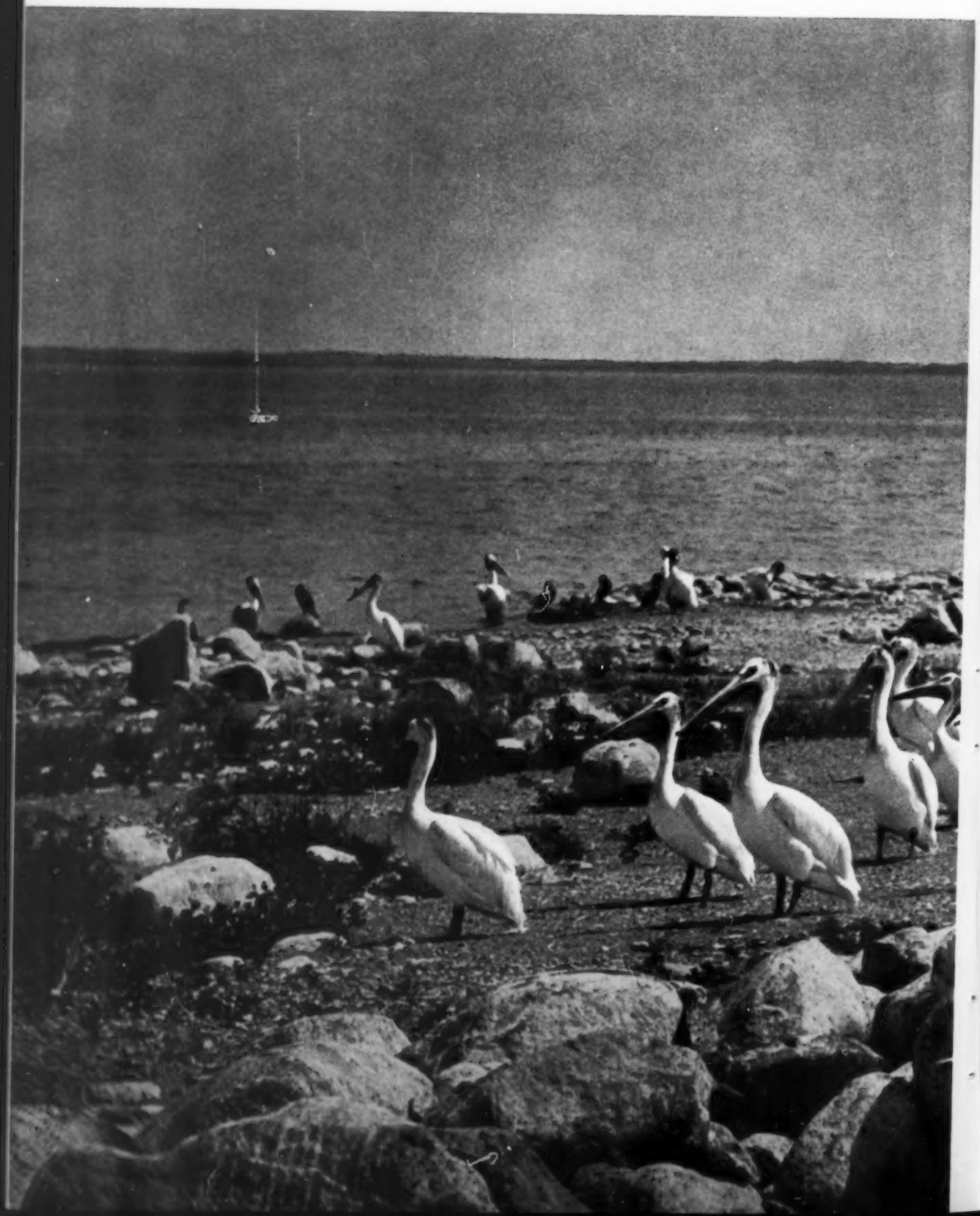
This is the Lake of the Woods that is calling you with her strong allure. She offers rest in the most beautiful surroundings you can imagine; she offers thrills amid her green islands; she offers memories of pine-scented air, curved fish glancing through the water, Indian ceremonials, unforgettable sunsets burning their bright colours upon the palette of the western heavens, and the first glint of evening stars surrounded by ineffable peace. The Lake of the Woods is calling you!

". . . sheeny, limpid, beckoning waters . . ."



"... unforgetable sunsets ..."

Wings Over Redberry Lake

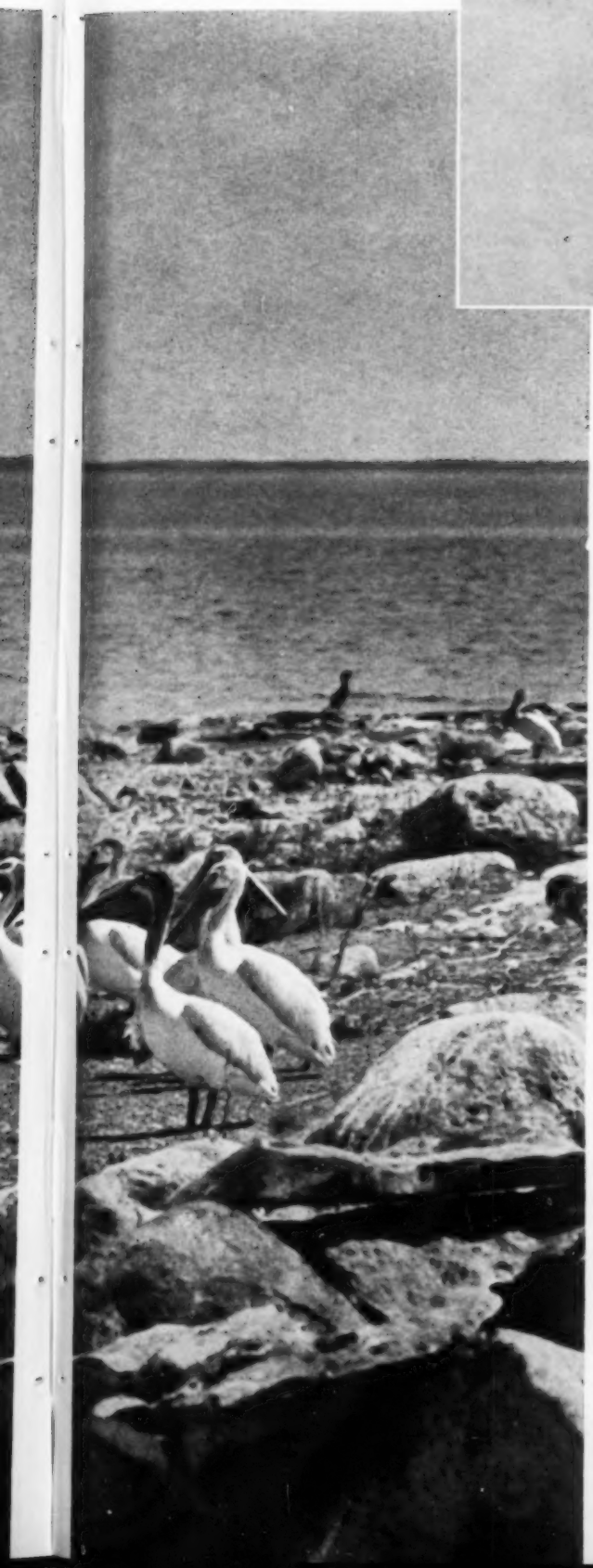


A lone pelican glides past the "hide" for a perfect two point landing.

by **W. W. COLEMAN**

Photos by the Author

IT is with much pride that we can point to the efforts and accomplishments of the past and present officers of the Canadian Government upon whom was settled the responsibility of preserving for both the present and future generations, the wealth of flora and fauna for which Canada is famous. It is no happy accident which has made these efforts so successful; it is the result of painstaking surveys of the sifting and sorting of field notes, of hours spent in consultation with eminent authorities who have made the habits of certain groups or even individuals of the animal world, their life's work. These are but a few of the means to an end. There is another phase of this work, even more difficult: that of arousing in the minds of many people the need of this type of conservation, which produces dividends of inestimable value, but which may take years or even generations to come to full maturity. This is truly difficult. Slowly but surely the resistance offered by disinterested peoples is giving way before education which has proven the most effective lever in stimulating in every citizen an interest in his heritage of the natural resources of the Dominion and in his sacred trust to see



Pelicans on parade, marching past the "hide," thoroughly accustomed to the presence of this new structure on their island domain.

that they are not squandered but used and enjoyed to their greatest capacity which can come only with discretion.

This interest of serious minded Canadians in conservation is not a recent awakening, though today it does enjoy the earnest support of many people and of organizations which have been formed for the purpose. These organizations and the men who lead them deserve your support for their ideals are noble and generous.

In the province of Saskatchewan the earliest record of conservation by the setting aside of certain areas to act as bird sanctuaries dates back to June 8, 1887 when the island and north end of Long Lake, now known as Lost Mountain Lake, were reserved for a breeding area for the great number of birds which congregated on this body of water. That such an order was executed fifty years ago is excellent proof of the sincerity and foresight of those intrusted with office. How well this example has been followed is revealed by the fact that today more than a dozen such areas have been reserved in this province alone, this in addition to the protection which is offered by the excellent system of National Parks of which Prince Albert is one of the most inviting and supports an inestimable number of birds both in and out of the breeding season.

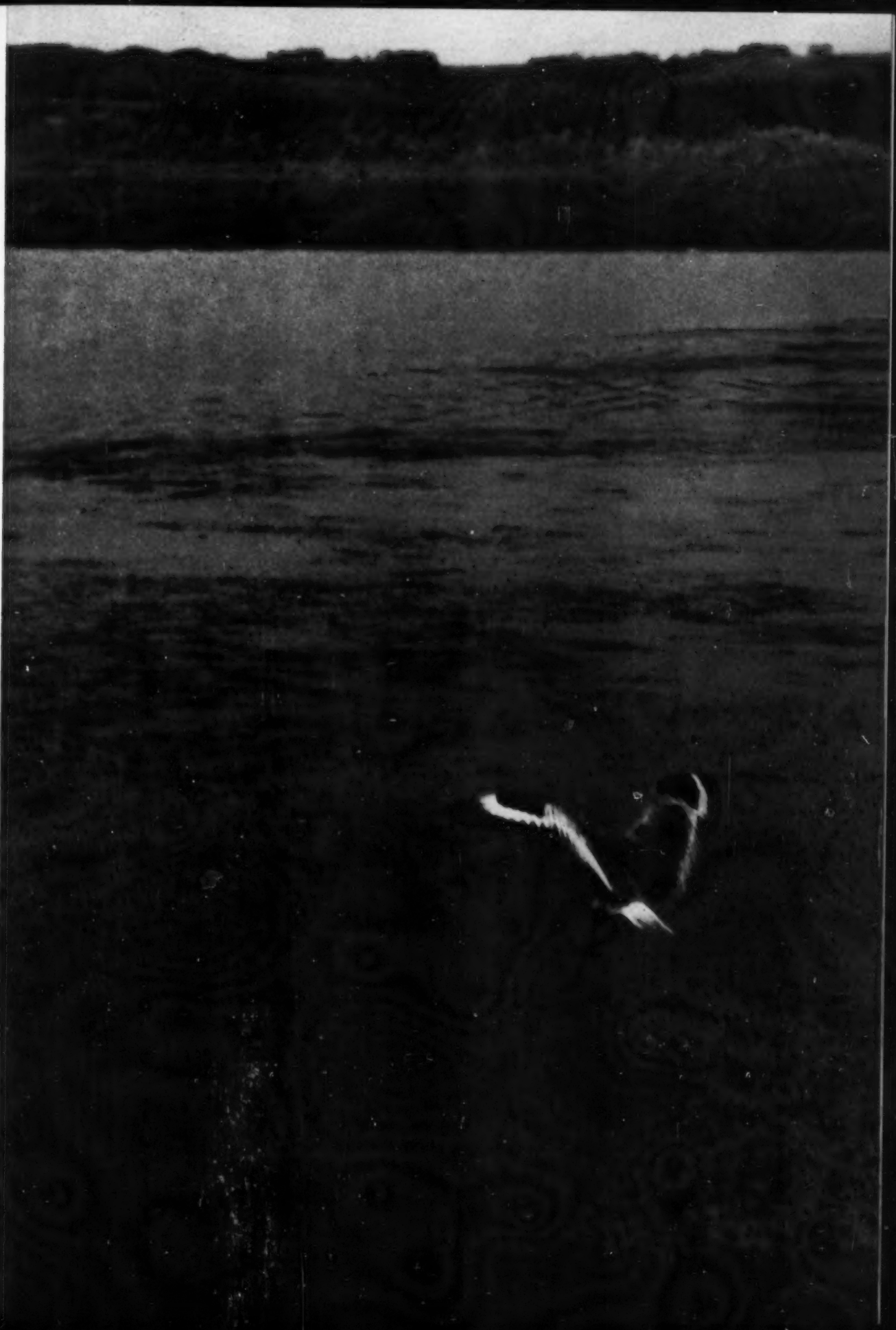
The past summer it was decided that we should spend some time at one of the sanctuaries making notes and photographic records and by publicizing our findings draw some attention to the fruits and benefits which are now so readily accessible. After much deliberation, the sanctuary at Redberry Lake was decided upon as our objective. This area was established under the Migratory Birds Convention Act by Order in Council, P.C. 345 of March 9, 1925 at which time a number of other areas were set aside for the same purpose. Later these sanctuaries were transferred from the Dominion to the Province under the Saskatchewan Natural Resources Act of May 30, 1930. The official description of this sanctuary is as follows: Redberry Lake. Comprising the land covered by the waters of Redberry Lake in townships 42, 43 and 44, range 8; townships 42 and 43 range 9 west of the 3rd meridian; the island in the said lake and the following quarter-sections; in township 43, range 8, west of the 3rd meridian, west half of section 28, section 29 and fractional west half of section 33; in township 44, range 8, west of the 3rd meridian, fractional southwest quarter of section 4."

A letter to the Provincial Deputy Minister of Natural Resources requesting permission to land and inspect the various islands and to make such photographic records as we desired was kindly received and the courtesy granted.

The Canadian National Railways take one within eighteen miles of Redberry Lake. Leaving the train at Borden, we had our equipment transferred to an automobile and were soon travelling a good dirt road which leads to the lake. It was the latter part of June and as we travelled over the prairie in midday we were impressed with the parched appearance of the countryside. Fields which had been planted in the spring and should by this time have supported a luxuriant growth of green grain offered only a burned-up brownish stubble to a pitiless sun in a cloudless sky.

The rolling country spotted with small farm buildings and even smaller school houses remained an attractive sight despite the havoc caused by the drought. The last mile was steadily down grade and a sharp curve brought the lake into vision before one was prepared. The property at the southernmost part of the lake is owned by Mr. W. W. Hoffman whose interest and sincerity in furthering the cause for which the sanctuary was established is to be praised. Although this property has been definitely commercialized, it has been carried out with notable restraint and a consideration for the natural beauty that is there. Several small cottages are set well back from the lake and practically screened by high shrubs. A good well, a small store and adequate toilet facilities make it an ideal place to spend a few quiet weeks and regain that enviable feeling of peacefulness that follows a bit of tran-

RIGHT—A Willet about to alight is sadly confused by the sudden emergence of an observer from a "hide."



quility. Both sail and power boats are available as well as row boats.

At the southermost tip of the lake a small stream enters after trying very earnestly to lose itself in a nearby marsh which offers an excellent retreat for ducks, grebes and other marsh-loving species while the very character of the territory prohibits any interference by man. No less than five grebe nests were observed within one-half mile distance. While wading through this marshy area a number of ducks with their flock of young ones were disturbed and with cries of alarm the parent bird would flop around feigning injury while her brood scuttled off to safer quarters or putting all their faith in protective coloration would crouch motionless in hopes of being unobserved. Several species of gulls were observed flying overhead, and at late evening great flocks of Franklin's Gulls were seen returning to the north end of the lake where we were told they spent the night. The south shore of the lake is patrolled by a company of Godwits which at the first interruption fill the air with their raucous screams. Walking along the beach one is most likely to be preceded by a Willet which appears to delight in keeping just out of camera range.

Having found the nest of Holboell's Grebe which was ideally situated for photography, operations were soon begun. The nest which was a semi-floating mass of vegetation, looking exactly like a small island, had been built around a submerged bit of drift-wood, anchored about eight feet out from the swampy shore. A rude blind was first erected on shore some six feet or more from the water and moved closer daily as the bird became accustomed to the strange structure. Their confidence readily kept pace with the approach of the hide. It was very interesting to note how the birds began to accept our presence on approaching the hide, for when it was first put up the birds were nowhere to be seen, yet on the fourth day the incubating bird remained on the nest until I was within ten feet, and then only left the nest to swim about in a very small circle, protesting vigourously all the while. On the fifth day pictures could readily be made without the use of the blind at all! Although such an opportunity may yield a fine bird record there is still sufficient alarm felt by the bird to prevent one making observations of the more intimate habits and family life of the subject. The observations made when the bird is completely at ease are far more interesting than just a good portrait. After having been in the blind several hours the bird settled down to that state of natural wariness which functions at all times and explains why they have been able to survive despite their persecution by thoughtless humans and their natural enemies. Among interesting habits displayed by the Grebe was its behaviour when disturbed while incubating. At this time she would glide off her eggs and having left the nest some eight or ten feet would sound her alarm note. The mate which often was so far distant as to be out of sight would soon be seen swimming swiftly in her direction while she leisurely paddled toward him. During this time calls would be frequently exchanged. Having met they would return to the nest which they would both circle. At the time one almost felt as if a conversation was taking place. The female expressed her fears and alarm while her mate swam about inspecting the home and tried to reassure his companion that such fears were groundless. Sometimes it seemed as though his arguments were convincing and she would by a series of clumsy waddling movements clamber up and on to the nest. There, standing very erect and astride the eggs, she would shake off the water droplets and then puffing out all her under part feathers settle ever so gently upon the eggs. Meanwhile the male would go off to some other portion of the lake which pleased his fancy. At other times his arguments would be of no avail, whereupon the female would by a series of surface dives in water from four to six feet deep collect a supply of water weeds and put this vegetation over the eggs until they were almost completely concealed. Then she would take a few hours off, only to return and resume her incubating duties, after first meticulously removing all the vegetable covering. This was dropped on the edge of the nest increasing its bulk.

The greatest attraction at Redberry Lake Sanctuary is Pelican Island, which

Erect, at ease, yet watchful, the Holboell's Grebe continues her duties of incubating.

The rocky barrier proved too difficult for these young pelicans who believed that safety lies in unity.

is about forty minutes distant by "kicker boat" from the south shore. The very stony nature of the island necessitates a wading landing but one is more than repaid for the wetting. The island, because it is so very low lying, is not visible from the southern mainland. It is a small strip of land not more than two hundred yards long and quite narrow with a rocky ridge down the centre. It supports but very little vegetation, a few scrawny gooseberry bushes beneath three of which we found duck nests.

As one approaches the island, a portion may seem to detach itself and drift away. This gleaming white mass is a raft of juvenile pelicans who are quite capable of taking care of themselves. It seems strange that some should be feathered and flying while others have not yet hatched but this is a constant notation where birds nest in great colonies. The entire island is possessed by birds and birds alone.

Your invasion is the signal for the release of pandemonium. The nests of the cormorants are rudely shaken by the energetic activities of the nearly grown young. These heavy compact baskets of twigs lodged here and there among the boulders are filled to over-flowing with young birds. At this stage they do not have that "cast in metal" appearance of the adults but are covered with a dense black woolly down. With their long snaky necks outstretched, their brilliant orange gular sacks vibrating rapidly and their wicked looking beaks opened to their greatest extent, they scream defiance at your intrusion. It is not a pretty sight. The young pelicans, however, appear to lose all their defiance as soon as the ambulatory stage is reached. When young and helpless, lying prostrate in their nests they "bark" as you approach and if strong enough will peck at anything they think within reach, but those capable of leaving the vicinity will do so in all haste. Their attempts at speed, however, are ludicrous in the extreme. Imagine a drove of dusty, white, woolly birds without a trace of quill feathers, larger than turkeys, with their stumpy wings held out from their sides, their big flat webbed feet striving unsuccessfully to balance their still larger bodies as they propel themselves over this boulder-strewn shore in mad haste. All of them at one time or another sit down on what should be their knees, but which are really their heels. Should one accidentally take a tumble, the rest of the company will walk over or on him till the last rear-guard has past, but as soon as the opportunity is gained, it will struggle to its feet and as quickly and grotesquely as possible waddle off to join its companions. When the immature birds are stampeded in this fashion, their huge feet striking the ground produce a remarkable amount of noise which is not unlike the rumble of distant thunder.

The large hide was erected and anchored, though not without considerable difficulty because of the wind. The size of the hide provided plenty of room for photographic equipment, a very small camp stool with a collapsible table (which collapsed all too often) and myself. When all was arranged to my satisfaction the help accompanying me left for the mainland in the little boat, leaving the island and all its teeming life to me.

I was pleasantly surprised when the adult birds began returning to their homes so quickly, the cormorants being the first to venture back. Within fifteen minutes after leaving the boat, the island quieted down once more with only an occasional scream of a gull. The gulls are a very rapacious lot. They make bold efforts to grab a young cormorant and only the united efforts of all those in the nest will discourage them. If, however, an adult cormorant returns, the gull does not linger very long to debate the question but stalks off, preserving its dignity as much as possible under the defeat. The very young pelicans, however, share a much worse fate, for I saw three newly hatched young greedily snatched up and an occasional egg showed a goodly sized hole made by a beak. Quite often the usual immaculate dress of the gulls would be streaked with crimson or yolk of egg.

From the blind I could often see cormorants rise from their fishing grounds and with heavy wing-beats approach the island. They did not fly directly to the nest but would alight on some prominent boulder in the vicinity and approach their young by a series of hops from stone to

stone, punctuating each advance with their harsh guttural cry of *ornk, ornk*. At this time the young would become a frenzy of action in anticipation of the fine feed at hand.

The pelicans however were much more wary and returned only several hours later. Led on by their curiosity, the three-quarter grown young were the first to venture into camera range, but soon the adults followed and by midafternoon I was completely surrounded by birds.

Lunches were endured rather than enjoyed. Practically the entire island is plastered with the excreta of the thousands of birds and even the scavenger habits of the gulls cannot cope entirely successfully with the mortality that is to be found in any great colony of birds.

Here a desire long wished for was fulfilled. By stretching out an arm through one side of the blind I could grasp a cormorant, or through the other side stroke a pelican. Unwittingly, I had been accepted by the winged population. To have such an experience, to see what conservation really means when placed in responsible and capable hands, to know that these great colonies of birds shall not become like the great flocks of Passenger Pigeons, a mere memory, is a source of pleasure and satisfaction.

The nest of the pelican is not an elaborate structure but the size of the eggs fills one with wonder.

Her screaming offspring satisfied for the moment, this Cormorant steals a nap in the glare of the sun.

On huge black pinioned wings hundreds of pelicans mount the air as our boat rushes up to the island.

The heavy compact nests of the cormorants with their complement of five to seven eggs dotted the western end of the island.

When alarmed, the female grebe would slide from the nest, then cover the eggs with sodden vegetation, meanwhile sounding her call notes. Soon her mate would appear and together they would swim about the nest Her fears allayed, the male swims off.

Tucked here and there among the boulders were the nests and young of the cormorants.

Individually and collectively these young cormorants clamour for food with the arrival of a parent.

"102nd Meeting of the American Association for the Advancement of Science"

THE one hundred-second meeting of the American Association for the Advancement of Science was held in Ottawa from June 27th to July 2nd on invitation of many national and local organizations and institutions. This was the fifth time the Association had met in Canada; previous meetings being held in Montreal in 1857 and 1882, and in Toronto in 1889 and 1921. Local arrangements were directed by a strong Canadian committee under the distinguished patronage of the Governor General, His Excellency Lord Tweedsmuir.
The Executive of the committee was as follows:

Honorary Chairman	Senator Raoul Dandurand
Chairman	Dr. C. Camsell
Vice-Chairmen	Dr. A. Beauchesne Dr. R. W. Boyle
Executive Members	Major G. Lanctot Dr. H. M. Tory
Secretary	H. L. Trueman

The direction of the various activities was in the capable hands of the following Committee Chairmen:

Finance	N. C. Allen, Dept. of Agriculture
Publicity	Ernest Rhoades, Dept. of Agriculture
Registration	L. S. McLaine, Dept. of Agriculture
Equipment	T. A. McElhanney, Dept. of Mines and Resources
Entertainment	Major M. F. Gregg, House of Commons
Program	F. E. Lathe, National Research Council

Under the direction of the Chairman of the Program Committee the following Canadian representatives co-operated with the Secretaries of the sections of the A.A.A.S. in developing the sectional programs:

B —Physics	Professor J. A. Gray, Queen's University, Kingston.
C —Chemistry	S. J. Cook, National Research Council, Ottawa.
D —Astronomy	R. M. Stewart, Dominion Observatory, Ottawa.
E —Geology and Geography	Dr. W. A. Bell, Geological Survey, Ottawa.
F —Zoological Sciences	Dr. A. Gibson, Department of Agriculture, Ottawa.
G —Botanical Sciences	Frère Marie-Victorin, University of Montreal.
H —Anthropology	Dr. D. Jenness, National Museum, Ottawa.
I —Psychology	Dr. E. A. Bott, University of Toronto.
K —Social and Economic Sciences	Professor V. M. Bladen, University of Toronto.
L —Historical and Philological Sciences	Dr. Lawrence Burpee, International Joint Commission, Ottawa.
M—Engineering	N. Marr, Department of Mines and Resources, Ottawa.
N —Medical Sciences	Dr. F. W. Burke, Department of Pensions and National Health, Ottawa.
O —Agriculture	H. G. Crawford, Department of Agriculture, Ottawa.
Q —Education	Dr. J. E. Robbins, Dominion Bureau of Statistics, Ottawa.

Through its 15 sections and its 165 associated and affiliated societies, the American Association for the Advancement of Science covers essentially the entire field of pure and applied science. It has an active membership of over 19,000 scientists in every part of the world, and the membership of affiliated societies now approaches a million.

Membership in the Association is not open to professional scientists alone, but also to amateur scientists, and the rapidly increasing number of intelligent persons who are interested in science and appreciate its importance for the future of civilization. Membership in the Association includes a subscription either to the official weekly organ, *Science*, or to *The Scientific Monthly*.

It is impossible in a brief report of the meeting to do more than mention a few of the important sessions. Over 350 papers were presented, and there was a registration of over 1,100 delegates. Many Canadian and American affiliated societies conducted programs.

An important feature of the general program was the continuation of the "Science and Society" series of lectures inaugurated at the Indianapolis meeting last December. The subject of the series at Ottawa was "Science and the Future" and papers were given by well-known authorities from the United States on the future of botany, zoology, physics, chemistry, the electrical industries and the metallurgical industries. This series was opened by two general papers, one on "World Standards of Living" and one on "World Natural Resources". The latter paper was contributed by a Canadian, Mr. F. E. Lathe, Director of the Division of Research Information, National Research Council, and was an excellent summary of this subject. Mr. Lathe reached the following conclusion:

"Thanks largely to science and technology, food supplies are likely to be adequate for a population at least three or four times that of today, provided that the problem of distribution can be solved; the world as a whole need fear no shortage, for an indefinite period, of the raw materials for clothing, shelter, heat, power, and the principal necessities and luxuries of life. Individually, however, many nations have inadequate supplies of a number of important raw materials; the situation is such as to emphasize the extreme mutual dependence of all nations except the United States, the British Empire and Russia, and as population increases this situation will be intensified. The highest standards of living can be attained only through world peace and international co-operation."

An effort was made in arranging the program of the Ottawa meeting to provide for definitely planned symposia rather than a loosely constructed program of unrelated papers. Such important subjects as The Genetics of Pathogenic Organisms; Present Status of the Psychology of Thinking; Micro-elements and Deficiency Diseases; Phytogeographical Problems of Northeastern Canada; Migration and Conservation of Salmon; The Nutrition Problem in North America; The Influence of Fire on Forests, Wild Life and Public Welfare; Economic Relations of Canada and the United States; The Business Outlook with Special Reference to Government Spending; Weather and Crop Yields; History of Science in Canada, and several other even more specialized subjects were thoroughly discussed.

One of the main features of the Summer Meeting is The Hector Maiben Lecture, usually delivered by an outstanding scientist or philosopher. The Canadian Committee was asked to recommend the lecturer in this case and Principal R. C. Wallace of Queen's University was chosen to speak on "The Changing Values of Science." An idea of the popularity of the speaker and the interest in the subject may be gleaned from the fact that one of the largest halls in Ottawa was crowded on a warm summer evening to hear Dr. Wallace. He gave a fine philosophical address which will be printed in an early issue of *Science*. In conclusion Dr. Wallace said:

"Two things impress themselves on me. The first is that the method and the attitude of science are indispensable for modern life and thought. No young men or women are equipped for life without that background, for they will live their lives in an atmosphere permeated with that outlook and that method. Without this equipment they are as passive spectators looking out on the active stream of life as it goes past, for they have not the technique to understand the significance of the processes of modern civilization.

"The second consideration — and it is even more fundamental — is that this kind of education is not enough for our time. It is imperative that the young scientist should know something of the problems of the psychologist, the philosopher, the economist, the sociologist and the statesman. Not that he should be familiar with the details of these vast fields; that is not humanly possible. But it is possible, and it is necessary, that he familiarize himself with one of the realms of human relationships and feelings, in order that he may place his science in its setting for modern needs. The value, and the influence of the man who works completely apart from, and without knowledge of, the deeper movements of mankind, grows less with the passing years; for he at least will play no part in that widening influence which science must exert on the solution of the problems which confront the human race.....".

Readers of the Canadian Geographical Journal will no doubt be interested to learn that the program of Section E — Geology and Geography — was well arranged and well attended. The session on Regional Geography ranged from the Ottawa District to the Chateauguay Valley, the Lower St. Lawrence, the Great Lakes and the Climates of British Columbia. The session on Physiography dealt mainly with the northern areas and the history of the St. Lawrence River. Geographic Problems of the Northern Frontier were discussed in relation to topography, cropping and air transportation. Aspects of the Mineral Industry dealt with geophysics, problems in metallurgical research and prevention of injury from mineral dust in human lungs. Going back into pre-history, there were two long sessions on Pre-Cambrian Economic and Stratigraphic Geology, and Pre-Cambrian and Paleozoic Geology. Following the meetings field excursions were arranged to the Ottawa Lowland, the Gatineau River section, to Madoc, and to the mining districts of Ontario.

In the section of Anthropology there were several important sessions dealing with the history of North American Indians and early history of Chinese and Egyptian Culture. The Engineering section spent considerable time on Flying Boats, Snow Performance of Aircraft Skis, and new aids to flying. Field trips were also conducted by the Botanical and Zoological sections, and the anthropologists journeyed to Toronto to be guests of the Royal Ontario Museum of Archeology. As might be expected the forestry specialists had an extensive and important program which reached its climax in a field trip to the Petawawa Forest Station, where two days were spent inspecting silvicultural experiments, fire control methods and forest entomology and pathology. The entomologists, both agricultural and silvicultural, had a full program and a large attendance. Agriculture provided one of the heaviest programs and drew about twenty per cent of the attendance at the convention.

As might be assumed from the above outline, the six-day meeting was not entirely a holiday for those in attendance. Nevertheless the different groups did manage to hold luncheons and dinners and play an occasional game of golf. The official Garden Party on Tuesday was held on the beautiful lawn of the Central Experimental Farm and was attended by over 1,500 people. Afternoon tea was served and the guests and visitors took the opportunity to visit a scientific exhibit set up by the Experimental Farm Service and the Science Service of the Dominion Department of Agriculture. The Macoun Memorial Garden was very attractive in appearance and drew many visitors. On Wednesday, afternoon tea was served to the wives of the delegates in the Parliamentary Restaurant.

The meeting was entirely successful and many expressions of appreciation have been received from visitors from the United States. There have been only two summer meetings of the American Association which have had a larger attendance, and according to officials of the A.A.A.S., there has been no summer meeting which has had a better balanced program than the Ottawa meeting.

EDITOR'S NOTE BOOK

Mr. J. Fergus Grant, author of the article in this issue on "Canada's Aircraft Industry," represents the Canadian Geographical Society in the Province of Quebec. As aviation and marine correspondent of the Montreal Gazette for eleven years (1926-1936), Mr. Grant was closely associated with the aeronautical industry of this country during that period of development. Besides flying over various sections of the transcontinental system, previous to cancellation in 1931 and 1932 of air mail services between Moncton and Calgary and Edmonton, to the Yukon last summer and across the Atlantic in 1930 abroad H. M. Airship R-100, he has flown in South America, South Africa and the Dutch East Indies. During his recent survey of the aircraft industry in Canada, Mr. Grant received the fullest support from companies concerned and various government departments, as indicated in the bibliography following his article.

Charles Clay, who is Literary Editor of the Winnipeg Free Press, has written articles in former issues of the Journal. His particular interests, arising out of several years' residence in the North Country, are Indians, fur-trade history, and Laurentian Plateau scenic beauty — all three of which contribute to his Lake of the Woods article. It is interesting to note that Mr. Clay has the peculiar distinction of publishing two books in the same year. As this appears, the MacMillan Co. of Canada is rushing to completion his *Swampy Cree Legends*, a compilation of legends from Manitoba Indian lore, and the Oxford University Press is preparing to print *Young Voyageur*, a rousing adventure novel for boys (and girls) from 17 to 70 years of age. It is about the fur trade in the West in 1775.

W. W. Coleman, who writes for this issue "Wings over Redberry Lake", is familiar with bird life in the province of Saskatchewan, and has already contributed an article to the Journal on this subject. Prior to becoming medical technologist to Dr. D. M. Baltzan in Saskatoon, he was for some time engaged in expedition work by the American Museum of Natural History, New York.

AMONGST THE NEW BOOKS

Official Map Publications, by WALTER THIELE, (Chicago American Library Association, $4.75). Libraries as a rule have only recently begun to realize the value of the map as a graphical record of the physical aspects and development of the country it depicts. This book is really designed to give the librarian an historic background on the subject of maps and to indicate where and how they may be obtained.

The first part of the book deals most adequately with the history of maps, and is of equal interest to the librarian, the geographer and the general reader. The subject of early maps is a fascinating one and perhaps a study of no other subject will better illustrate the advance of western civilization as we know it from the narrow fringe of the Mediterranean litoral where our first records begin. The author follows the evolution of maps from the days of Greece and Rome through the middle ages and Renaissance and down to the modern topographical map with its wealth of detail. The book is written in a pleasant and easy style and is adequately referenced and annotated. The inclusion of cuts illustrating representative maps of various periods would have made the text much easier to follow.

The second part of the book lists and describes various types of maps now available and gives information as to where they may be obtained. Being an American publication it gives perhaps too much space to American maps many of these listed being of little or no general interest and useful only for administrative purposes. The section on Canadian maps, while covering the material available, was unfortunately prepared before the organization of the new Department of Mines and Resources, in December 1936 and therefore does not indicate correctly the present arrangement of mapping services in this country. Valuable information regarding maps of South America and of several European countries is also included and it is to be regretted that an effort was not made to include the work of other map producing countries and dominions even at the expense of some abridgment in other parts of the book. A final chapter is devoted to map filing and cataloguing and five appendices on various phases of the subject conclude the book.

This book contains in concise form an immense amount of valuable information which cannot readily be obtained elsewhere and is a credit both to the author and the organization sponsoring his work. Any criticism would be directed not at the subject matter of the book but rather at the fact that it does not cover an even wider field.

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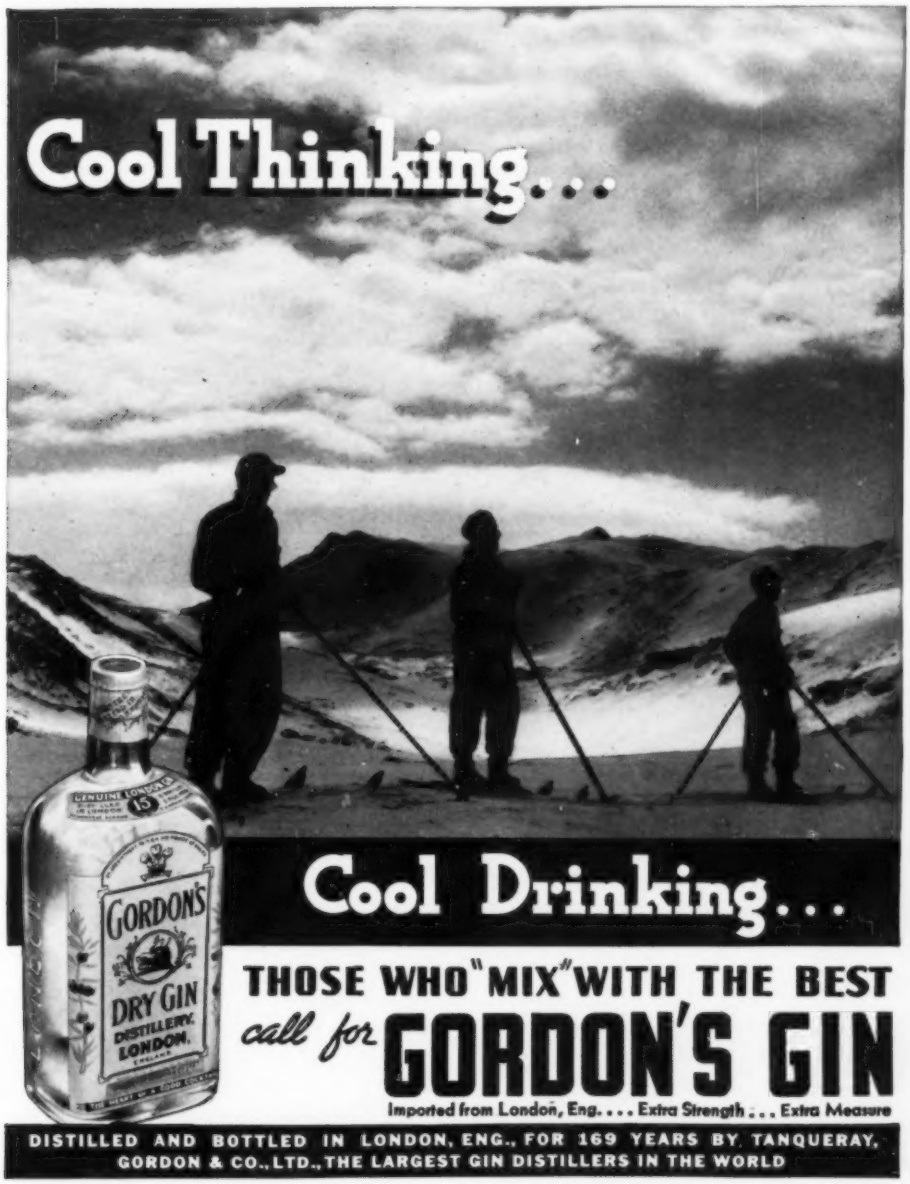
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